OTMC 100

User Manual

Smart Measurement Solutions®

Manual Version: OTMC100.ENU.2

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Preface & General Safety Instructions

This user manual provides information about the *OTMC 100* series grandmaster clocks, their possible fields of application and how to install and operate them. It furthermore provides information about how to access and configure the devices using a computer.

Following the instructions given in this user manual will help you avoid danger, repair costs and down time, and help maintain the reliability and life of the *OTMC 100*.

In addition to the user manual, the applicable safety and lightning protection regulations in the country and at the site of operation as well as the usual technical procedures for safe and competent work should be observed.

General safety instructions

Before operating the *OTMC 100*, carefully read the following general safety instructions:

- The *OTMC 100* may only be used in a safe technical condition taking into account its defined purpose, safety requirements and possible risks as well as the operating instructions given in this user manual!
- The *OTMC 100* is exclusively intended for the application areas specified in chapter Introduction and Designated Use on page 9. The manufacturer or the distributors are not liable for damage resulting from unintended usage. The user alone assumes all responsibility and risks.
- Do not open the *OTMC 100*! Opening the device invalidates all warranty claims!
- The *OTMC 100* is an SELV device (Safety Extra Low Voltage) which is supplied with power by Power over Ethernet (PoE according to IEEE 802.3af). It may only be connected to Ethernet network ports or Power over Ethernet power supplies.
- Always use the waterproof RJ45 Ethernet connector supplied with the *OTMC 100* in order to maintain the watertightness of the device. Do not use the *OTMC 100* outdoors without a waterproof connector inserted.
- For outdoor installation always use shielded Ethernet cable. The cable shield has to be connected to the shield of the Ethernet connectors.

1 Compliance Statements and Recycling

Declaration of Conformity (EU)

The product adheres to the specifications of the guidelines of the council of the European Community for meeting the requirements of the member states regarding the electromagnetic compatibility (EMC) Directive 2004/108/EC and the RoHS Directive 2011/65/EU.

FCC Compliance (USA)

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Declaration of Compliance (Canada)

This Class B digital apparatus complies with Canadian ICES-003.
Cet appareil numérique de le classe B est conforme à la norme NMB-003 du Canada.

1.1 Information for Disposal and Recycling

This test set (including all accessories) is not intended for household use. After use the test set cannot be disposed of as household waste!

For customers in EU countries (incl. EEA)

OMICRON test sets are subject to the EU Waste Electrical and Electronic Equipment Directive 2002/96/EC (WEEE directive). As part of our legal obligations under this legislation, OMICRON offers to take back the OMICRON test set and ensure that it is disposed of by authorised recycling agents.

For customers outside the EEA

Please contact the competent authorities for the relevant environmental regulations in your country and dispose the OMICRON test set only in accordance with your local legal requirements.

2 Introduction & Designated Use

The *OTMC 100* is an antenna-integrated GPS controlled time reference. It provides high-precision time to synchronize intelligent electronic devices (IEDs), computers and measurement equipment in Ethernet (TCP/IP) based networks. The *OTMC 100* series products can be used as a PTP (Precision Time Protocol) grandmaster clock according to the IEEE 1588-2008 standard and as an NTP (Network Time Protocol) time server for NTPv4 compliant equipment according to RFC 5905.

The fields of application for the *OTMC 100* series products include applications in industrial production involving automatic test equipment (ATE), time critical banking and telecom applications as well as protection and control applications in the electrical power industry. The *OTMC 100* is the right choice wherever accurate time in a computer based network is needed.

Due to the unique combination of GPS antenna, GPS receiver and time signal processing, the *OTMC 100* can be directly connected to Ethernet networks without the need of additional RF cable installation.

The *OTMC 100* series is designed for outdoor use in lightning protected areas. It is intended for fixed installation on masts. For installation requirements, please refer to the Quick Start Guide provided with the product or Suitable Mounting Positions on page 16.

The following *OTMC 100* models are available:

OTMC 100*i*: Time reference for use in industrial applications supporting the IEEE 1588-2008 default profiles.

OTMC 100*p*: Time reference for use in the electrical power industry. In addition to the IEEE 1588-2008 default profiles, the *OTMC 100p* also supports the power profile according to IEEE C37.238-2011 (IEEE Profile for Use of IEEE 1588-2008 Precision Time Protocol in Power System Applications) specifically used in the electrical power industry.

For reasons of simplicity this manual uses the general term "*OTMC 100*" if the features and functionality described are common for all products of the *OTMC 100* series. The complete names *OTMC 100i* and *OTMC 100p* are only used to indicate differences between the models.

The unique design of the *OTMC 100* series offers many advantages:

- Web browser interface (called Web Interface) allowing for intuitive and straight forward setup and control. The use of DHCP/Auto IP and the OMICRON Device Browser tool allows for easy remote access to all functions and features from a computer.
- Outstanding precision. Synchronized to the GPS satellite navigation system, the *OTMC 100*'s internal clock achieves a time accuracy of +/- 100 ns to reference time (UTC).
- No need for rack space in server rooms due to outdoor mounting.
- Extremely low power consumption < 2 W.
- Full compliance with IEEE 1588-2008 (IEEE 1588 version 2).

- Easy installation. No additional power supply required through PoE (Power over Ethernet).
- Ethernet cable length up to 100 m (standard Ethernet). Can be increased to up to 2 km by using fiber optic Ethernet and media converters.
- Automatic cable length compensation compensates errors due to propagation delays on the network.
- Automated configuration. The possibility to upload configuration files enables easy exchange and configuration of the hardware.
- The *OTMC 100* enables redundant configurations as defined in IEEE 1588-2008. The best master clock algorithm (BMCA) guarantees that the best clock in the system is used as the master clock. An automatic changeover to another clock is performed if the active master clock no longer provides sufficient time accuracy.
- Due to its integrated NTP server functionality the *OTMC 100* can also be used in networks containing devices that are not yet ready for PTP. The *OTMC 100* is able to simultaneously operate as NTP server and PTP grandmaster clock.

The following features are supported by the *OTMC 100* software:

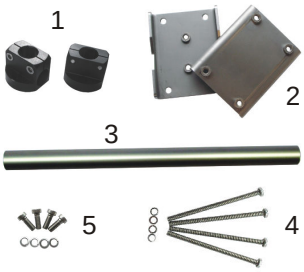
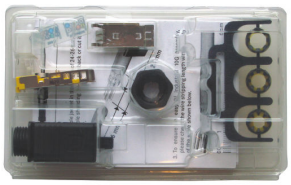
- Time:
  - IEEE 1588-2008 version 2 support:
    Default E2E (end-to-end) and P2P (peer-to-peer) profile
    Power profile acc. to IEEE C37.238-2011 (*OTMC 100p* only)
    One step and two step operation
    Multicast transport
    IPv4, IPv6 and layer 2
    PTP management interface
    High performance (up to 512 messages per second)
  - NTPv4 (according to RFC 5905)
  - Time (according to RFC 868)
  - Daytime (according to RFC 867)
- Networking:
  - 10Base-T/100Base-TX Ethernet
  - IPv4 and IPv6
  - DHCP/Autoconf
  - Zeroconf (mDNS/DNS-SD)
  - OMICRON OMFind service
  - Differentiated services according to RFC 2474: Configurable DSCP for PTP packets

- Linux operating system:
  - TFTP, FTP and SSH access
  - Syslog (local and remote)
  - E-Mail notification
- Configuration:
  - Web Interface (HTTP & HTTPS)
  - Automated configuration via SSH and XML files
  - SNMP (for IEEE C37.238-2011)
- Failsafe software upgrades in the field

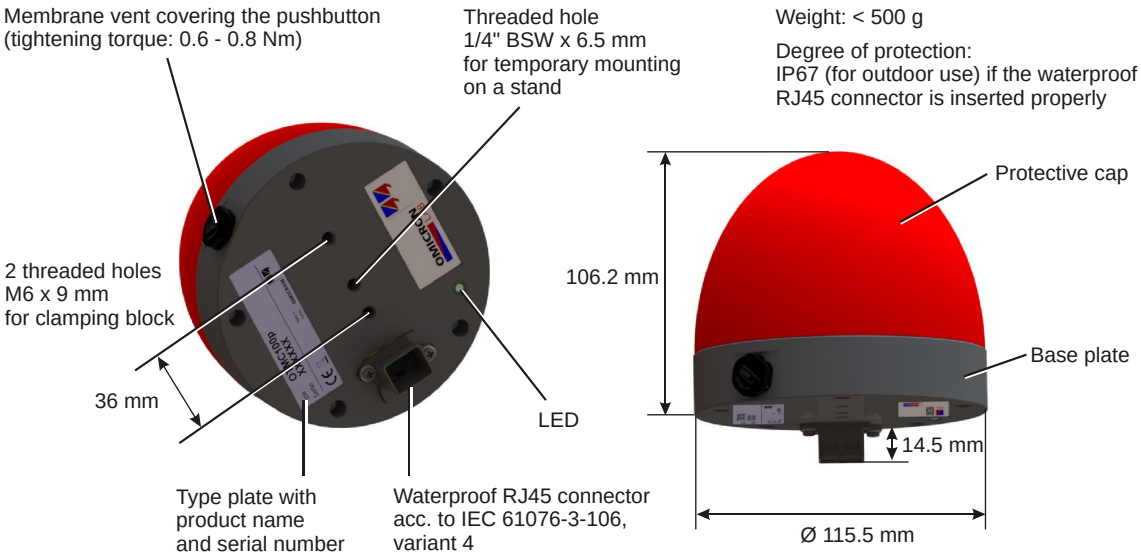
OTMC 100 series products are exclusively intended for the applications stated in this chapter. Any other use is considered improper.

3 Scope of Delivery, Ordering Information, Accessories

Description	Part No.	Figure
OTMC 100*p*: PTP grandmaster clock for application in power system environments. **OTMC 100*i***: PTP grandmaster clock for application in industrial environments. The delivered set includes in addition: • 1 mast mounting kit for mast diameters of 25 to 70 mm (see OL000350 for details) • 1 waterproof RJ45 connector • 1 standard Ethernet patch cable (3 m) • 1 *OTMC 100* Quick Start Guide (printed) • 1 CD ROM containing the OMICRON Device Browser software, the PDF versions of the *OTMC 100* Series User Manual and the OTMC 100 Series Quick Start Guide, and the source code of the Open Source products used in the *OTMC 100* software	OL000300 OL000301	 **OTMC 100*p*** **OTMC 100*i***

Mast mounting kit for mast diameters of 25 to 70 mm (accessory). Kit consisting of: • 2 clamping blocks (1) • 2 clamping jaws (2) • 1 connection pipe 20 x 300 mm (3) • 4 screws M6 x 110 with 4 lock washers (4) • 4 screws M6 x 16 with 4 lock washers (5)	OL000350	
Waterproof RJ45 connector acc. to IEC 61076-3-106, variant 4 (accessory)	OL000351	

4 Device Overview



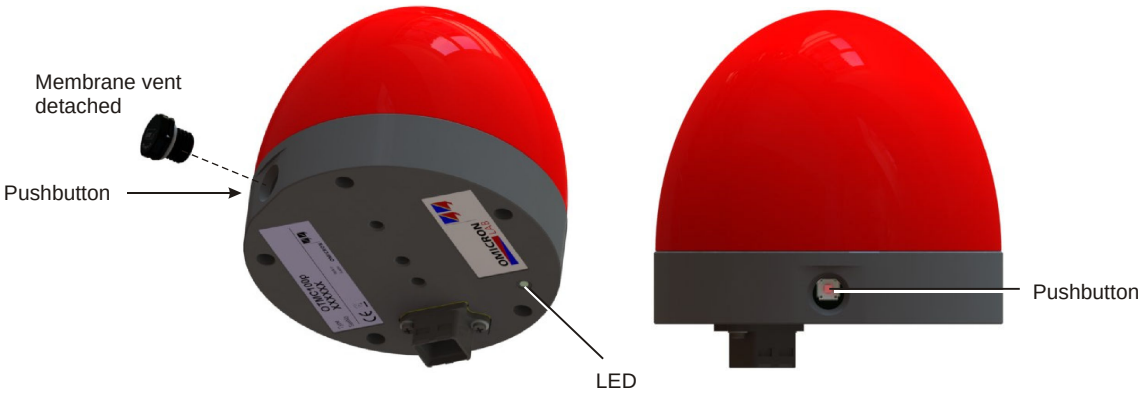
The *OTMC 100* does not provide an ON/OFF switch! The device automatically powers up after supply voltage is provided via Ethernet (PoE).

The **LED** indicates the device status:

LED continuously off	The *OTMC 100* is not supplied with power via the RJ45 Ethernet connector.
LED lights red	Boot process during power-up or device reboot is in progress.
LED flashes red	Software update is in progress. ATTENTION: Do not disconnect the *OTMC 100* from its PoE source (Ethernet network) during a software update!
LED lights orange	Intermediate state when entering the recovery mode manually or when initiating a factory reset (see also Operating Procedures Performed Directly on the Device on page 35).
LED flashes green	The *OTMC 100* is in the recovery mode, waiting for new software. In the recovery mode, the device provides only a rudimentary Web Interface just allowing for the upload of a software image (see also Operating Procedures Performed Directly on the Device on page 35).

LED lights green	The *OTMC 100* is ready for operation. The green LED does not provide information about the number of satellites received or the actual time accuracy provided by the *OTMC 100*. Such information are displayed in the **Status** pages (see page 43) of the Web Interface.

The **pushbutton** can be accessed after unscrewing the water-tight membrane vent.



The pushbutton can be used to:

- Initiate a device reboot.
- Initiate a factory reset to reset the device configuration to the factory defaults (for example, if you forgot your password).
- Enter the recovery mode in order to upload software to the device (for example, after a software update process failed).

Please refer to Operating Procedures Performed Directly on the Device on page 35 for more detailed descriptions.

5 Mounting

5.1 Safety Instructions

A position with good view to the sky will usually be located in a lightning endangered zone outside of a building. The *OTMC 100* must not be exposed to direct lightning strokes and thus has to be protected sufficiently. Therefore, the *OTMC 100* has to be mounted in an area protected by a lightning protection system according to the relevant standards and regulations. The user is responsible for sufficient lightning protection of the device and the observance of all lightning protection regulations relevant for the site of installation.

Always use the waterproof RJ45 Ethernet connector supplied with the *OTMC 100* in order to maintain the watertightness of the device. Do not use the *OTMC 100* outdoors without a waterproof connector inserted.

CAUTION

Risk of injury or damage due to high voltages caused by lightning stroke.

- The installation of the *OTMC 100* and the implementation of lightning protection measures have to be performed by accordingly qualified experts.
- Always observe all relevant lightning protection regulations.
- The local lightning protection regulations and the protection concept of the building and the electrical installation may require a suitable surge protection device for the Ethernet network cable leading into the building.
- For outdoor installation always use shielded Ethernet cable. The cable shield has to be connected to the shield of the Ethernet connectors.

5.2 Suitable Mounting Positions

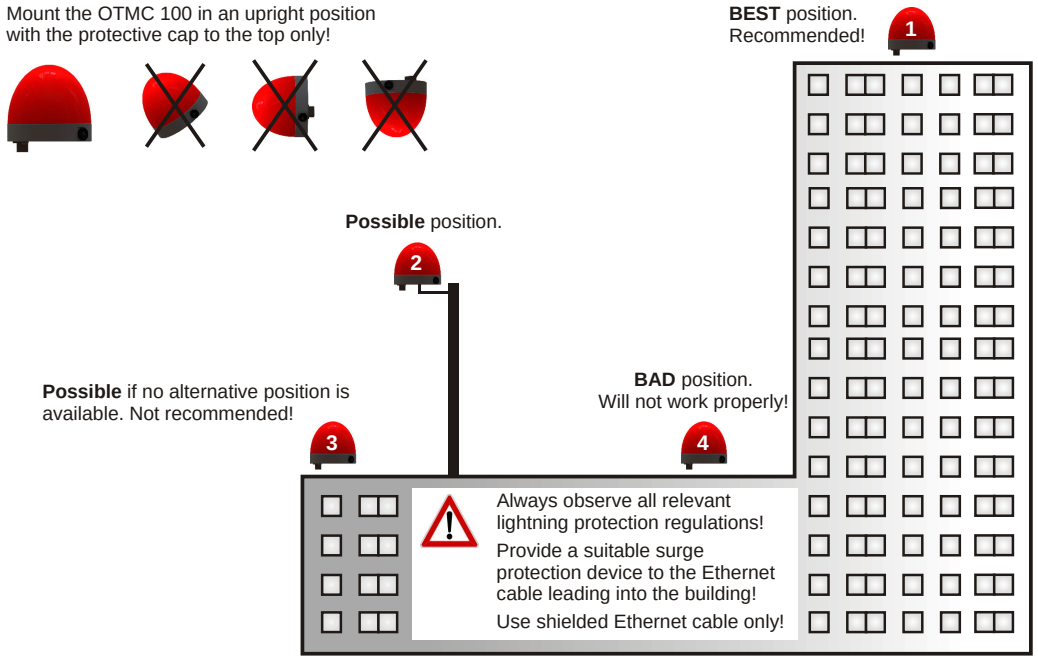
The *OTMC 100* receives the time information from the satellites of the GPS system. However, GPS reception generally requires a plain line of sight between the antenna and the satellites.

For proper function, the *OTMC 100* requires signal reception from at least 4 GPS satellites. The more satellites it can receive, the more reliable the time information the *OTMC 100* can deliver.

The *OTMC 100* should generally be mounted outdoors at a location that provides free view in a range of 180° vertically to the sky and 360° horizontally around the device. The view to the sky must not be blocked by any objects. This is usually given when mounting the *OTMC 100* on a roof or a sufficiently high mast. Refer to the figure below.

You should furthermore consider that GPS signals may be reflected by large buildings and structures around the *OTMC 100*, which may deteriorate the timing accuracy of the *OTMC 100*.

Always mount the *OTMC 100* in an upright position with the protective cap to the top, as shown in the figure below. The RJ45 connector on the base plate of the *OTMC 100* must point vertically downwards. Do not mount the *OTMC 100* inclined to any side or with the base plate to the top!


Mount the OTMC 100 in an upright position with the protective cap to the top only!
BEST position. Recommended!
1
Possible position.
2
Possible if no alternative position is available. Not recommended!
3
BAD position. Will not work properly!
4
Always observe all relevant lightning protection regulations!
Provide a suitable surge protection device to the Ethernet cable leading into the building!
Use shielded Ethernet cable only!

1 Recommended mounting position with best possible reception of GPS signals.
This mounting position provides direct view to the sky. The view is not hindered by any objects and the GPS signals are not influenced by any reflections.

2 Possible mounting position providing sufficient reception of GPS signals under most conditions. This mounting position provides direct view to the sky in a range of nearly 180°. The view is only partly hindered and there is negligible danger of reflections that could influence the GPS signals.

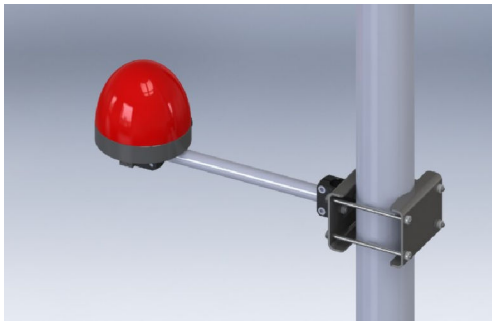
3 Possible mounting position if no other mounting position is available. Not recommended!
This mounting position provides direct view to the sky for a range of more than 90° but much less than 180°. The view to the right is hindered by the taller part of the building and there is an increased danger of reflections that could influence the GPS signals.

4 Bad mounting position. Do not use!
This mounting position provides direct view to the sky for a range of only 90°. Half the sky is blocked by the taller part of the building and the reception of GPS signals will be considerably influenced by reflections. The *OTMC 100* will not work properly!

5.3 Mounting Instructions

There are two possible ways for mounting the *OTMC 100*. Refer to the subsections below for detailed mounting instructions.

Mast mounting using the delivered mast mounting kit.



Temporary mounting using the 1/4" BSW (British Standard Whitworth) thread for mounting on a stand, for example.

5.3.1 Mounting Instructions for Mast Mounting

The mast mounting kit delivered with the *OTMC 100* contains the following parts:

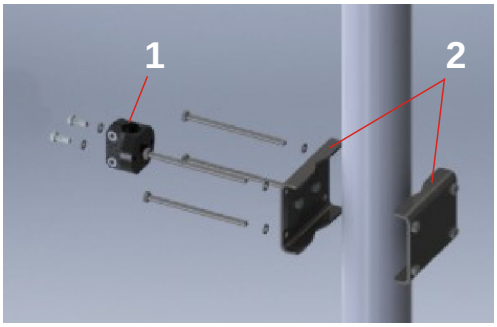
- 1 mast clamp consisting of 2 clamping jaws and 4 fastening screws M6 x 110 with lock washers
- 2 clamping blocks and 4 fastening screws M6 x 16 with lock washers
- 1 connection pipe 20 x 300 mm

Proceed as follows:

Assemble the mast clamp and attach it to the mast as shown in the figure.

The mast clamp is suitable for mast diameters of 25 to 70 mm.

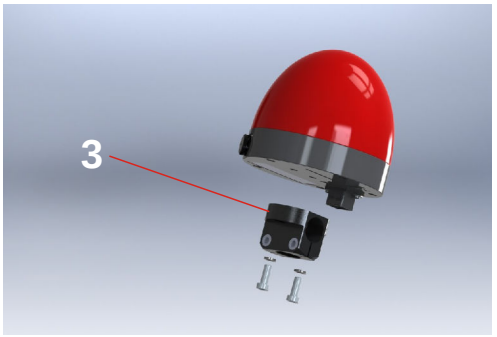
Use a tightening torque of 5 Nm for the fastening screws of the clamping block (1). The tightening torque for the fastening screws of the mast clamp (2) depends on the material and diameter of the mast.



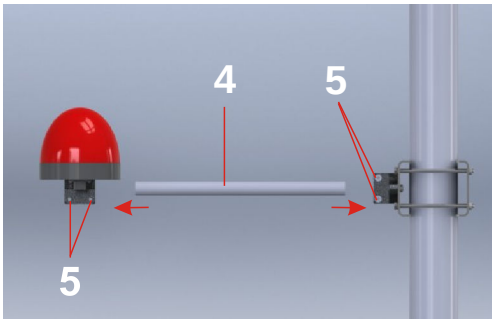
Attach the clamping block (3) to the base plate of the *OTMC 100* as shown in the figure.

Use a tightening torque of 5 Nm for the fastening screws.

Exclusively use the two M6 x 16 screws delivered with the mast mounting kit! Do not use longer screws! The threaded holes in the base plate are only 9 mm deep.

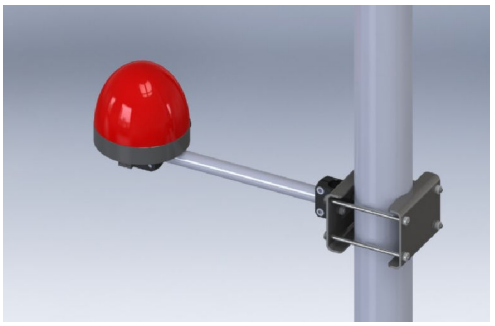


Insert the connecting pipe (4) to the clamping blocks on the mast clamp and the *OTMC 100* as shown in the figure.



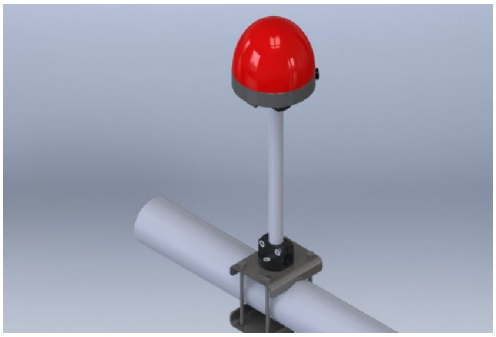
Align the *OTMC 100* in an upright position as shown in the figure and tighten both clamping screws (5) of the clamping blocks evenly with a tightening torque of 5 Nm.

Assemble the delivered waterproof RJ45 connector to the Ethernet cable according to the accompanying assembly instructions and insert it to the RJ45 connector on the base plate of the *OTMC 100*. Use suitable cable ties to fasten the Ethernet network cable to the connecting pipe and the mast.



Always use the waterproof RJ45 Ethernet connector supplied with the *OTMC 100* in order to maintain the watertightness of the device. Do not use the *OTMC 100* outdoors without a waterproof connector inserted.

The clamping blocks provide holes for horizontal and vertical mounting of the connecting pipe. Therefore, it is also possible to mount the *OTMC 100* on the top of a vertically mounted connecting pipe, as shown in the figure on the right.

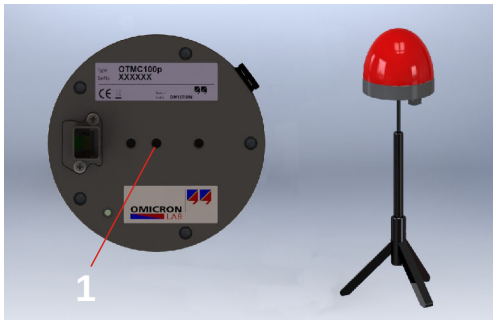


5.3.2 Mounting Instructions for Temporary Mounting Using the 1/4" BSW Thread

Screw the grub screw of the stand into the 1/4" BSW (British Standard Whitworth) thread (1) on the base plate of the *OTMC 100* and tighten it sufficiently.

The threaded hole in the base plate is 6.5 mm deep. Make sure not to screw in the grub screw too deep!

Assemble the delivered waterproof RJ45 connector to the Ethernet cable according to the accompanying assembly instructions and insert it to the RJ45 connector on the base plate of the *OTMC 100*. If necessary, use suitable cable ties to fasten the Ethernet network cable to the stand.



Do not move the *OTMC 100* during operation. Changing the position of the *OTMC 100* during operation causes time errors.

6 Connection, Access & Initial Setup

6.1 Connecting the OTMC 100 to an Ethernet Network

Note regarding network switches:
The precise synchronization of clocks via Ethernet networks requires that the propagation delay times for data packets is constant on the entire network. Network switches that do not provide transparent clock functionality may introduce jitter and thus influence the propagation delay. Therefore, the *OTMC 100* will only be able to provide highly accurate time synchronization in networks that that are equipped with network switches providing transparent clock functionality as specified in IEEE 1588-2008 or that do not have a network switch at all.

Do not connect conventional RJ45 connectors that are equipped with a locking pane to the *OTMC 100*! The locking pane of such connectors cannot be accessed directly anymore after inserting the plug to the *OTMC 100*. In this case, a small screwdriver must be used to carefully unlock the RJ45 connector in the socket. Use the **waterproof RJ45 connector** supplied with the *OTMC 100* instead or, when using a cable with a conventional RJ45 connector (for test purposes only!), break off the locking pane at the RJ45 connector before inserting it to the *OTMC 100*.

The *OTMC 100* is supplied with power by Power over Ethernet (PoE) according to IEEE 802.3af. If the network port the *OTMC 100* is connected to does not provide PoE, a PoE injector has to be used as shown in the figure below.

The *OTMC 100* supports Ethernet cable lengths of up to 100 m without the need of repeaters. By using additional media converters the use of optical Ethernet is possible, which allows much longer distances. Depending on the used variant it is possible to cover distances up to 2000 m. For further details, please refer to the user manual of the media converters used.

The *OTMC 100* automatically powers up after inserting the RJ45 plug and providing supply voltage to the *OTMC 100*. After the device is supplied with voltage, the LED first lights up red for approx. 15 s during the boot process and then changes to green to indicate operational readiness.

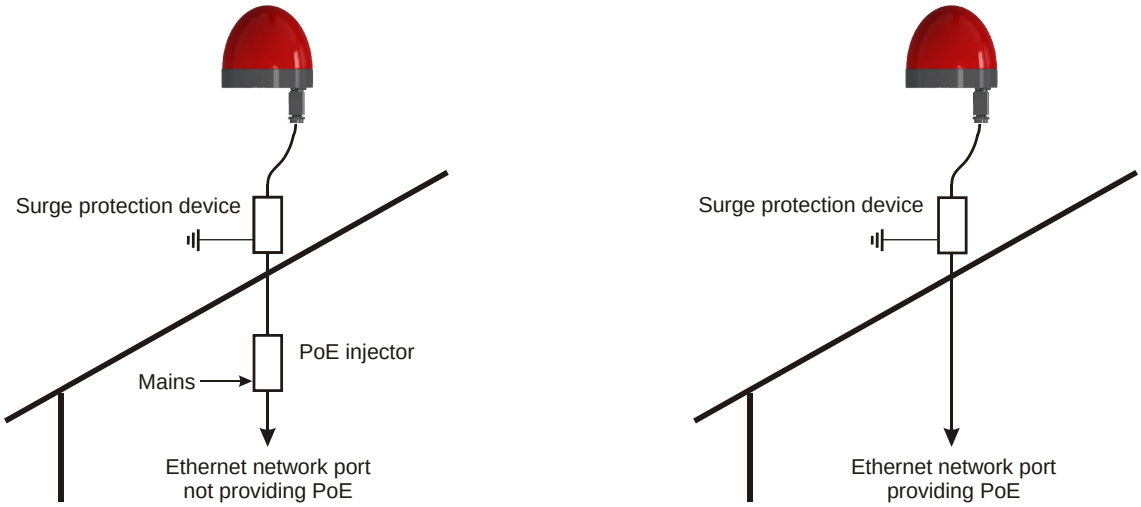
The *OTMC 100* is a class 1 powered device (PD) as defined in IEEE 802.3af (power consumption < 3.84 W). The network port the *OTMC 100* is connected to must be able to supply a class 1 powered device.

CAUTION

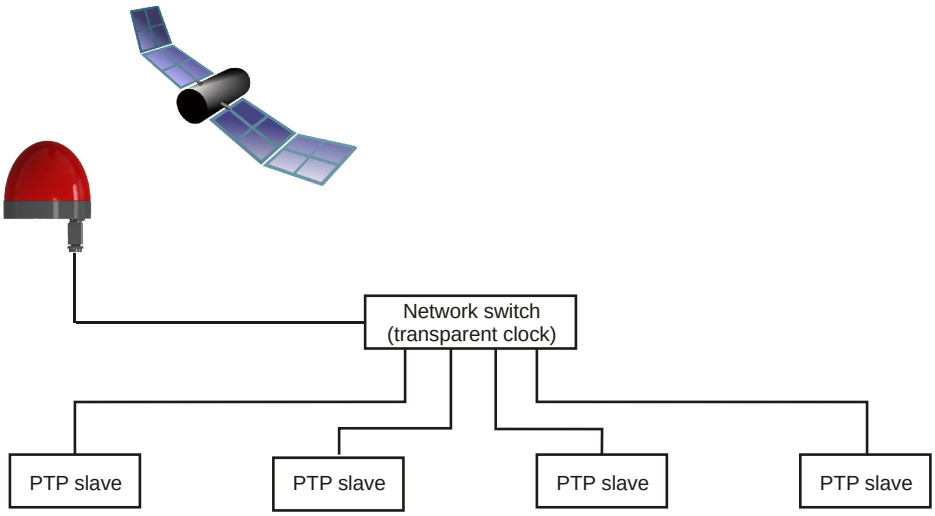
Risk of injury or damage due to high voltages caused by lightning stroke.

The local lightning protection regulations and the protection concept of the building and the electrical installation may require a suitable surge protection device for the Ethernet network cable leading into the building.

The following figure shows the general arrangement of the *OTMC 100*, the surge protection device and the PoE injector (if necessary).



The following figure shows a typical network with one *OTMC 100*, a network switch providing transparent clock functionality, and several PTP slaves.



6.2 Accessing the OTMC 100 from a Computer

The *OTMC 100* automatically powers up after supply voltage is provided via Ethernet (PoE). The LED lights up green when the device is ready for operation.

After that, a network IP address is assigned automatically in order to connect the device to the network. If a DHCP server is available in the network, the IP address is assigned by the DHCP server. If not, the *OTMC 100* automatically selects and assigns a link-local IPv4 and IPv6 address by itself.

The *OTMC 100* can be configured completely via the Web Interface using a computer. This way, no manual intervention at the device itself will be required under normal circumstances.

6.2.1 System Requirements

Your computer must fulfill the following requirements to access the *OTMC 100* Web Interface:

- Network port configured for operation in the network the *OTMC 100* is connected to.
- OMICRON Device Browser installed (see chapter The OMICRON Device Browser on page 96).
- Web browser installed (Microsoft Internet Explorer 9 or higher, Mozilla Firefox, or Google Chrome).

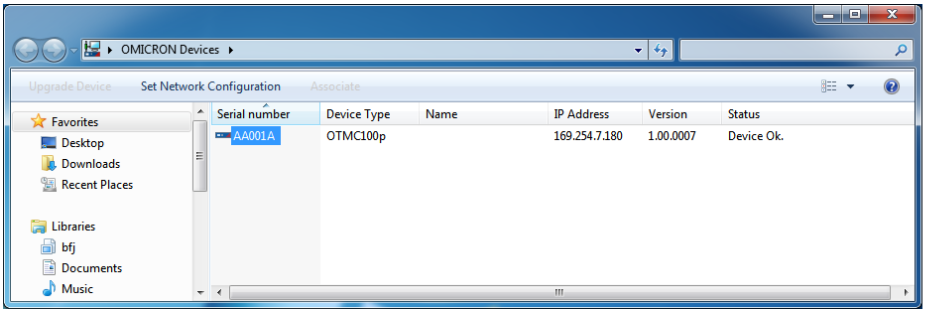
If you are accessing the *OTMC 100* from a Mac or Linux operating system supporting zeroconf, you can access the web interface of the *OTMC 100* by entering **http://<hostname>.local** to the address bar of your web browser. The default hostname is a combination of the device type and the serial number separated by dash, for example: OTMC100p-AA001A. The serial number is available on the type plate on the bottom side of the *OTMC 100* (labeled "SerNo").

6.2.2 Accessing the OTMC 100 Web Interface

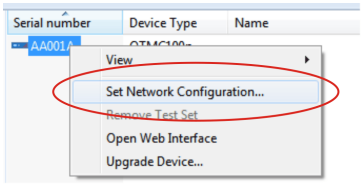
Proceed as follows to access the *OTMC 100* Web Interface:

1. Connect your computer to the network.
2. If necessary, install the OMICRON Device Browser on your computer. See chapter The OMICRON Device Browser on page 96.
3. Launch the OMICRON Device Browser.

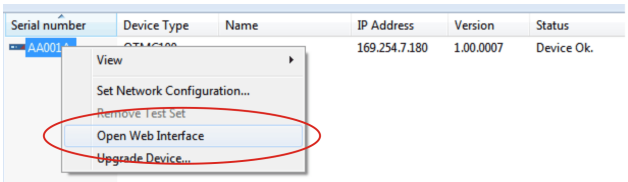
4. The Device Browser will automatically find and display the *OTMC 100*.



If the IP address configurations of the *OTMC 100* and the computer are not compatible, the respective status is displayed in the Status column. In this case, right-click the *OTMC 100* serial number and select **Set Network Configuration** to assign a suitable IP address to the *OTMC 100*.

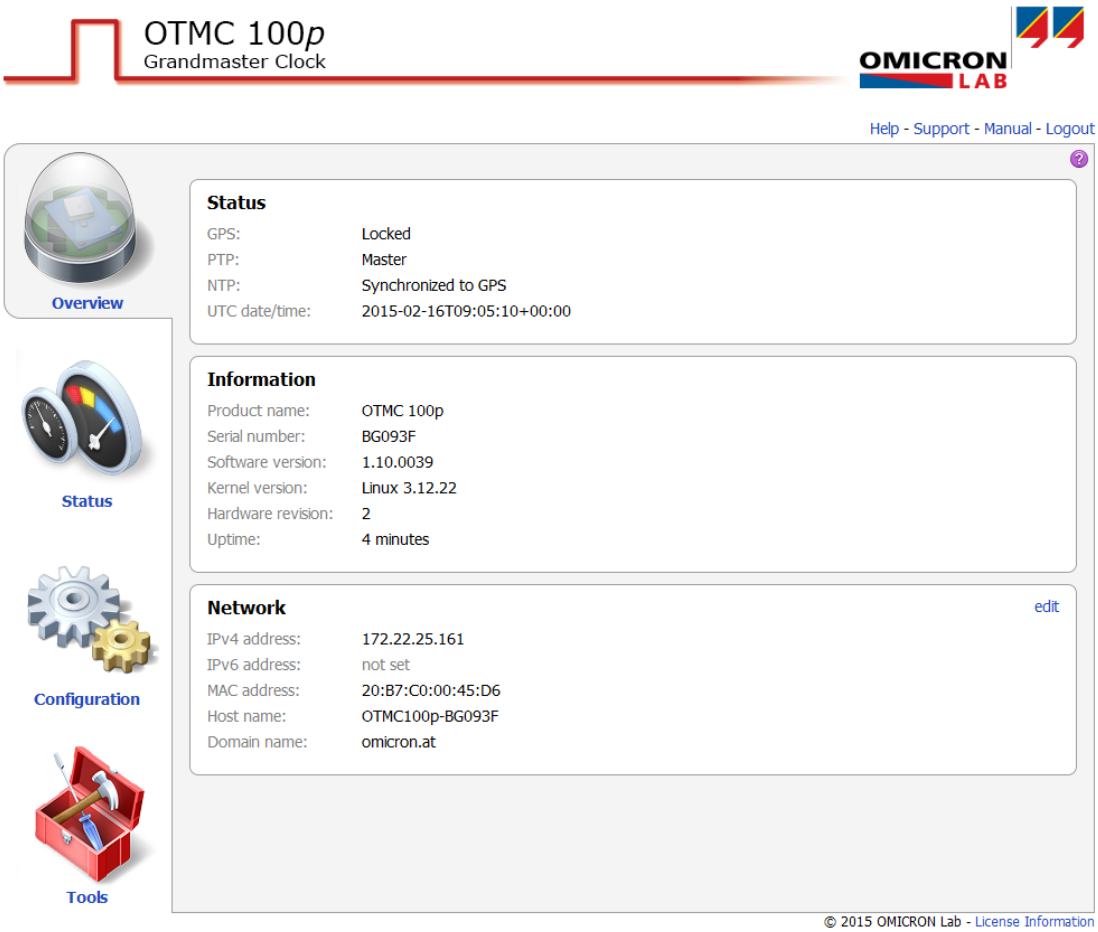


5. Right-click the *OTMC 100* serial number and select **Open Web Interface** from the context menu.



6. The Web Interface is opened in a web browser.
Password protection is disabled by default. If a password has been defined for the *OTMC 100*, a login dialog is displayed. Enter your password and click **Login**.

7. The start page of the *OTMC 100* Web Interface is displayed.



8. Proceed with section 6.3 Next Steps to Set Up the OTMC 100 on page 27 in order to configure the *OTMC 100* according to your needs.

6.3 Next Steps to Set Up the OTMC 100

After connecting the *OTMC 100* to the network and accessing the device from your computer, you have to configure the *OTMC 100* according to your needs.

See chapter The OTMC 100 Web Interface on page 38 or the *OTMC 100* online help for a detailed description of the Web Interface, or section Operating Procedures Performed via the Web Interface on page 30 for a description of the most important operating procedures.

Proceed as follows to set up and configure your *OTMC 100*. Consult your network administrator if you do not know the correct settings.

1. Configure the network settings.
   Open the **Configuration** section of the Web Interface and display the **Network** page (see page 64).
   a. Configure the network/IP settings according to the needs of your network. Click the **Save All** button to save and apply your settings.

By default, the *OTMC 100* will attempt to get an IPv4 address via DHCP and assign an IPv6 address using the automatic configuration. If no DHCP server is available for IPv4, the *OTMC 100* uses the zeroconf service to automatically assign an IP address on its own.

2. Configure the PTP settings.
   Display the **PTP** page of the **Configuration** section (see page 75). Select your configuration and click the **Save** button to save and apply your settings. The most important PTP settings are:

   a. **PTP profile** (General Settings pane): All PTP devices that should synchronize to each other must use the same profile.

      - Use the **Default E2E** or **Default P2P** profile for industrial environments.
        Default P2P (peer-to-peer) can only be used if the switches used in the network support and are configured for operation as peer-to-peer transparent clocks as defined in IEEE 1588-2008.
        Use Default E2E (end-to-end) if standard switches are used in the network and the higher synchronization error introduced by these switches is acceptable. The Default P2P profile and the Power Profile according to IEEE C37.238-2011 will not work with those network switches.
      - Use the **Power systems** profile for power utility environments where all devices are known to use the Power Profile according to IEEE C37.238-2011 (*OTMC 100p* only).

   b. **Operation mode** (General Settings pane): Always use the **one step** operation mode unless there are devices in the network that do not correctly handle one step master clocks.

   c. **Domain number** (Default Settings pane): All PTP devices that should synchronize to each other must use the same domain number.

   d. **Transport** (Port Settings pane): Select the transport mechanism according to the needs of your network. All PTP devices that should synchronize to each other must use the same transport mechanism.

3. Secure your *OTMC 100* against unauthorized access.
   Display the **Security** page of the **Configuration** section (see page 69). Select your configuration and click the **Save** button to save and apply your settings.

   a. Display the **Access Control** pane and set the **Access** field to "Password".

   If you set the **Access** field to "Password" without defining a password, the default password *timeserver* will be used.

   b. Enter a password to the **Change Password** field and repeat your password in the **Confirm Password** field. Click the **Change** button to save and apply your settings. From now on, entering the password is required to access the *OTMC 100*.

   c. In the **Protocol** field, select whether you want to allow access via the secure HTTPS protocol only or via HTTPS and the unsecure HTTP protocol.
   By default, password transmission to the *OTMC 100* is performed unencrypted. By selecting **HTTPS only** you can force the use of the encrypted HTTPS protocol and thus protect your password.

   When accessing the *OTMC 100* via HTTPS, an "untrusted connection" message may appear because the *OTMC 100* does not have a valid certificate. To avoid such messages, it is necessary to provide the *OTMC 100* with such a certificate. Please refer to subsection "Generate Certificate pane" in section Security Configuration Page on page 69 for more detailed information.

   d. In the **Services** field, select whether you want to allow access to the *OTMC 100* via the Web Interface (**Web**) or the Application Programming Interface API (**SOAP**) only or via both interfaces (**Web and SOAP**).

   e. **Protocol restrictions**: Disabling services that are not required or used for operation will minimize potential points of attack and thus make the *OTMC 100* safer.

   - Usually the OMICRON Device Browser is used to find the *OTMC 100* in the network. However, the OMICRON Device Browser may also be used to change the network configuration of the *OTMC 100*. To protect your *OTMC 100* against unauthorized or unintentional configuration changes using the OMICRON Device Browser, deselect the **Allow OMFIND network configuration** option.
   - If you want to prohibit standard user/password authenticated access to the *OTMC 100* via secure shell (SSH), deselect the **Allow SSH password login** option. When deselected, access via SSH is only possible via key based authentication. This reduces the risk of unauthorized access to the *OTMC 100* through brute force attacks.

   The options in the **Protocol Restrictions** pane of the **Security** page just enable or disable protocol options. In order to completely disable a service, use the **Services** pane of the **Network** configuration page.

7 Operating the OTMC 100

The following sections describe the most important operating procedures for the *OTMC 100*. Please refer to chapter The OTMC 100 Web Interface on page 38 or the Web Interface help for a detailed description of the Web Interface.

7.1 Operating Procedures Performed via the Web Interface

This section describes the most important operating procedures that can be performed via the Web Interface using a computer.

In order to operate the *OTMC 100* via the Web Interface you must access the device from a computer, e.g., using the OMICRON *Device Browser* (see section Accessing and Configuring the OTMC 100 from a Computer on page 24).

7.1.1 Viewing the GPS, PTP, NTP and Network Status

1. The overall GPS, PTP, NTP and network status is displayed in the **Overview** page of the Web Interface.
2. To display more detailed status information, click the **Status** icon in the navigation bar of the Web Interface.
3. Click the **GPS**, **PTP**, **NTP**, or **Network** icon of the **Status** section to display the status pages (see page 43) showing the information.

7.1.2 Defining a Password

If no password is defined for accessing the *OTMC 100*, a corresponding note is displayed on the **Overview** page providing the possibility to directly access the security configuration (see page 69) in order to enable password protection.

1. Click the **Configuration** icon in the navigation bar of the Web Interface.
2. Click the **Security** icon of the **Configuration** section and display the **Access Control** tab.
3. Enter your password to the **Change password** field and repeat it in the **Confirm password** field.

The password is case sensitive and must have at least 5 characters (letters, figures or special characters).

4. In the **Access** field, select **Password** to activate password protection.

If you set the **Access** field to **Password** without defining a password, the default password *timeserver* will be used.

5. In the **Protocol** field, select whether you want to allow access via the secure HTTPS protocol only or via HTTPS and the unsecure HTTP protocol.
   By default, password transmission to the *OTMC 100* is performed unencrypted. By selecting **HTTPS only** you can force the use of the encrypted HTTPS protocol and thus protect your password.
6. In the **Services** field, select whether you want to allow access to the *OTMC 100* via the Web Interface (**Web**) or the Application Programming Interface API (SOAP) only or via both interfaces.
7. Click the **Save** button.
8. Your new password is applied to the *OTMC 100* and a login dialog appears.

For more information, please refer to Security Configuration Page on page 69.

Perform a factory reset on the device if you forgot your password (see Operating Procedures Performed at the Device on page 35).

7.1.3 Running a Software Update for the OTMC 100

Please note that the *OTMC 100* will not deliver time information during a software update.

1. Click the **Tools** icon in the navigation bar of the Web Interface.
2. Click the **Software Update** icon.
3. Click the **Browse...** button to navigate to the software image file and select it.
4. Deselect the **Keep settings** check box if you want to reset the device configuration to the factory defaults after the software update. If the check box is selected, the user specific configuration settings are kept during the software update.
5. Click the **Update** button to start the software update.
6. The update process may take up to ten minutes. Do not disconnect the *OTMC 100* or the computer during this process.
7. The *OTMC 100* automatically restarts after the software update has completed.

If the software update process fails due to any reason, the *OTMC 100* enters a recovery mode on the next power-up. In this mode, the device provides only a rudimentary Web Interface (similar to the **Software Update** page) just allowing for the upload of a software image (see Operating Procedures Performed at the Device on page 35).

7.1.4 Performing a Reboot of the OTMC 100

A device reboot can also be performed directly on the device (see Operating Procedures Performed at the Device on page 35).

1. Click the **Tools** icon in the navigation bar of the Web Interface.
2. Click the **Device Control** icon.
3. Click the **Reboot** button next to **Reboot device**.
4. The *OTMC 100* performs a reboot. The device will be ready for operation again after approx. 15 s.

7.1.5 Performing a Factory Reset (Reset to Factory Defaults)

A factory reset can also be performed directly on the device (see Operating Procedures Performed at the Device on page 35). Performing a factory reset may possibly result in an IP address change of the *OTMC 100* due to automatic IP address assignment by a DHCP server.

1. Click the **Tools** icon in the navigation bar of the Web Interface.
2. Click the **Device Control** icon.
3. Click the **Reset** button next to **Factory reset**.
4. The *OTMC 100* performs a reboot and resets all configuration settings to the factory defaults. The device will be ready for operation again after approx. 15 s.

7.1.6 Creating a System Snapshot for Troubleshooting

A system snapshot contains the configuration settings and the log file. It thus provides important information for the technical support in case of problems.

1. Click the **Tools** icon in the navigation bar of the Web Interface.
2. Click the **Device Control** icon.
3. Click the **Download** button next to **System snapshot** to download a system snapshot file.

7.1.7 Uploading New Software to the Device in Recovery Mode

Entering the recovery mode manually is only possible using the pushbutton on the device (see Operating Procedures Performed at the Device on page 35).

The recovery mode is entered automatically if a software update performed via the Web Interface fails.

1. In recovery mode the device provides a rudimentary Web Interface solely allowing for the upload of a software image.
2. Click the **Browse...** button to navigate to a suitable software image file.
3. Click the **Update** button to start the software update.
4. The update process may take up to ten minutes. Do not disconnect the *OTMC 100* or the computer during this process.
5. The *OTMC 100* automatically restarts after the software has installed completely.

7.1.8 Assigning an IP Address Manually

The IP address of the *OTMC 100* is usually assigned automatically. If a DHCP server is available in the network, the IP address is assigned by the DHCP server. If not, the *OTMC 100* automatically selects and assigns an IP address on its own.

Assigning an IP address manually is only necessary if the automatic IP address assignment does not work due to specific characteristics of the network.

1. Click the **Configuration** icon in the navigation bar of the Web Interface.
2. Click the **Network** icon of the **Configuration** section and display the **IPv4** pane (or **IPv6** if the network supports IPv6).
3. Select **IPv4 static IP address** in the **Configuration** field.
4. Enter the **IP address**, the **Network mask**, the **Gateway** address and the **Name server** address in dot-decimal notation (e.g.: 192.168.1.100).
5. Click the **Save** button to upload and save your settings in the *OTMC 100*.

See also section Network Configuration Page on page 64.

7.1.9 Viewing and/or Exporting the System Log File

The log file contains all events logged by the system. Therefore, it may be helpful for the technical support of OMICRON in case of problems.

Which types of events are actually logged by the system can be selected in the Log & Notifications configuration (see page 85).

1. Click the **Status** icon in the navigation bar of the Web Interface.
2. Click the **Log Viewer** icon to display the log file.
3. View the messages logged in the file. Error messages are displayed in red, warning messages are displayed in orange, notice messages are displayed in black. All other messages are displayed in gray.
4. By clicking **Clear View** you can clear the display of the **Log Viewer** page. This does not clear the log file. Re-opening the **Log Viewer** page will again display all messages logged in the log file.
5. By clicking **Export Log** you can export the log file content to a text file (file extension .log).

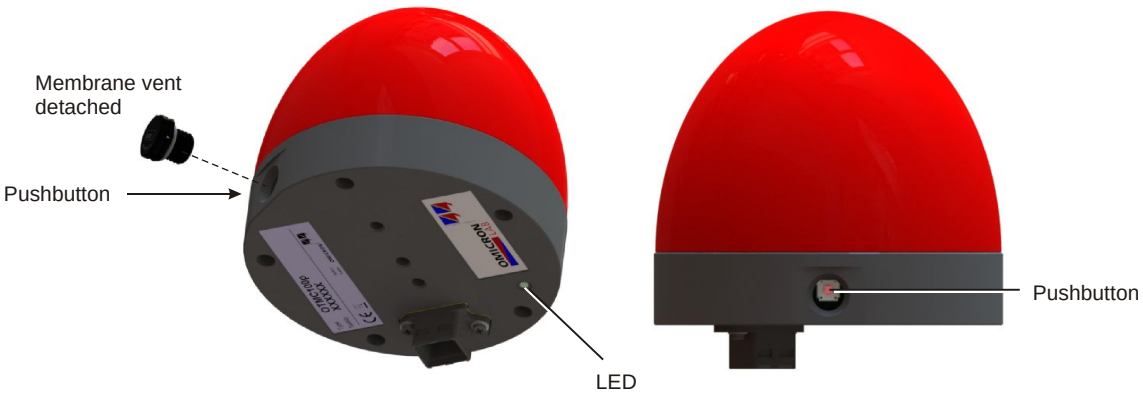
The log file is saved in the persistent memory of the *OTMC 100*. If the maximum size of the log file is reached, the system automatically deletes old log file entries in order to release memory space for new entries.

7.2 Operating Procedures Performed Directly on the Device

This section describes the operating procedures that can be performed directly at the *OTMC 100* using the pushbutton. The pushbutton can be accessed after unscrewing the water-tight membrane vent. Use a pointed tool such as a ball-pen to press the pushbutton.

WARNING

Do not forget to reinsert the membrane vent in order to restore watertightness. Tighten the membrane vent with a tightening torque of 0.6 to 0.8 Nm.



7.2.1 Performing a Reboot of the OTMC 100

A device reboot can also be performed via the Web Interface (see Performing a reboot of the OTMC 100 on page 32).

1. Press the pushbutton and release it immediately.
2. The LED goes off for approx. 1 s.
3. The LED lights up red during the boot process.
4. After approx. 15 s the LED changes to green to indicate operational readiness.

7.2.2 Performing a Factory Reset (Reset to Factory Defaults)

A factory reset can also be performed via the Web Interface (see Performing a factory reset on page 32). Resetting the device to the factory defaults may be necessary if you forgot your password, for example.

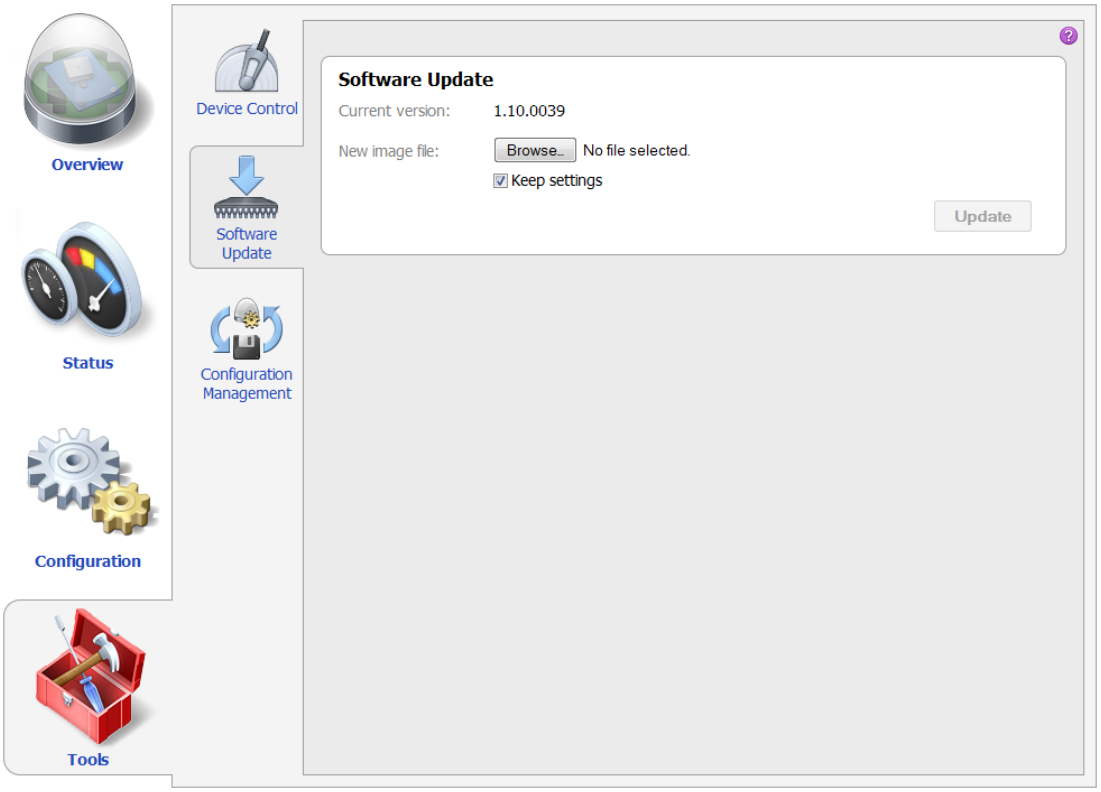
1. Press the pushbutton and keep it pressed.
2. The LED goes off.
3. After approx. 5 s, the LED lights up orange. Keep the button pressed and wait until the LED lights up red.
4. Release the pushbutton.
5. After approx. 15 s the LED changes to green to indicate operational readiness.
6. The device now has the factory default configuration settings.

7.2.3 Entering the Recovery Mode Manually (and Uploading New Software to the OTMC 100)

Entering the recovery mode manually is not necessary under normal circumstances since the recovery mode is entered automatically if a software update performed via the Web Interface fails.

1. Press the pushbutton and keep it pressed.
2. The LED goes off for approx. 5 s.
3. Release the pushbutton as soon as the LED lights up orange.
4. After approx. 20 s the LED flashes green to indicate the recovery mode.

5. Open the OMICRON Device Browser and right-click the *OTMC 100* (see Accessing the OTMC 100 from a Computer on page 24). Select the **Upgrade Device** option from the context menu. The device provides a rudimentary Web Interface allowing for an upload of a software image.

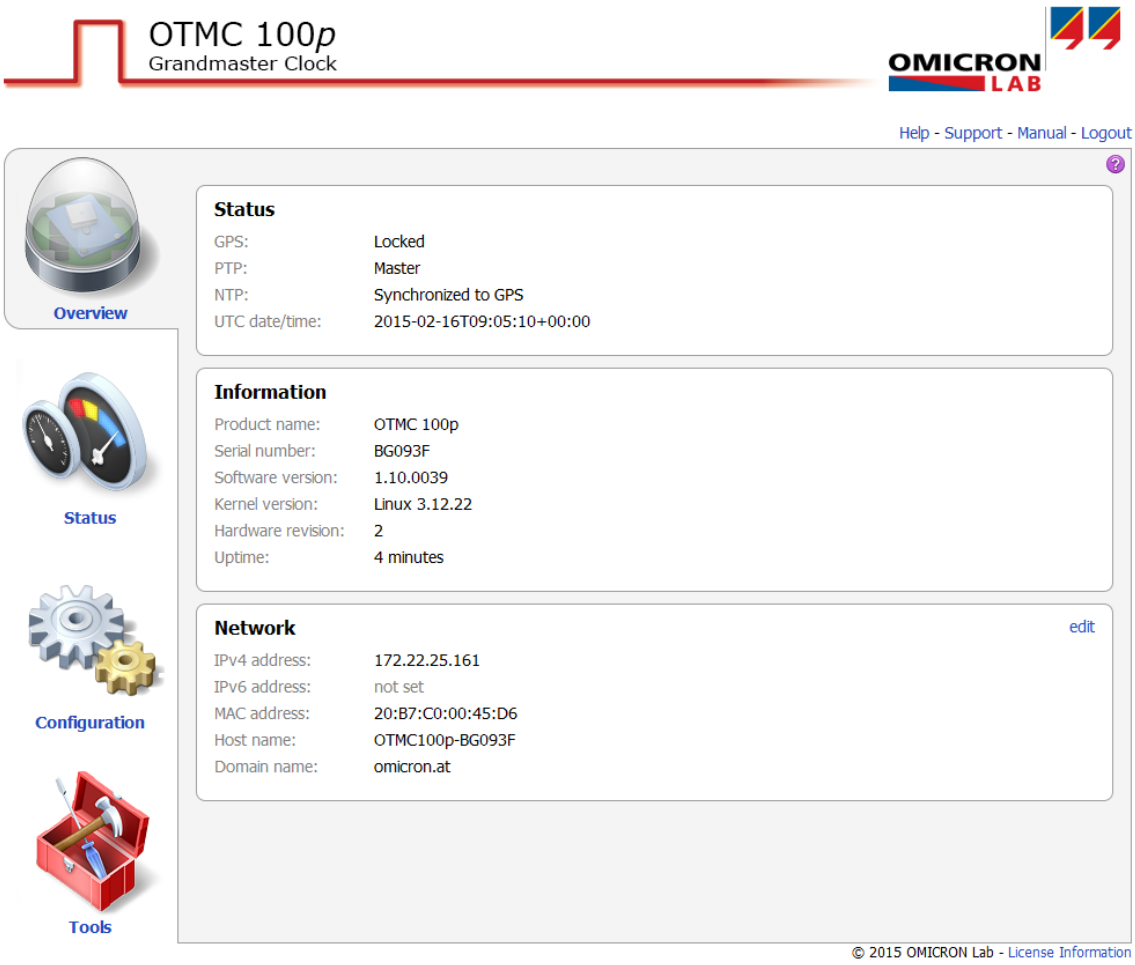


6. Click the **Browse...** button to navigate to a suitable software image file. The path and file name is displayed in the field after selecting it in the file open dialog.
7. Click the **Update** button to start the software update. The update process may take up to ten minutes. Do not disconnect the *OTMC 100* or the computer during this process. The *OTMC 100* automatically restarts after the software has installed completely.

8 The OTMC 100 Web Interface

The Web Interface is used to access and configure the *OTMC 100* using a computer.

Click the help icon in the top right corner of a page to display the specific help topic for this particular page. Click **Help** in the top right corner of the Web Interface to open the start page of the help system for the Web Interface.



Click **Support** in the top right corner to open the contact information page providing OMICRON contact addresses and information how to contact the technical support of OMICRON in case of problems.

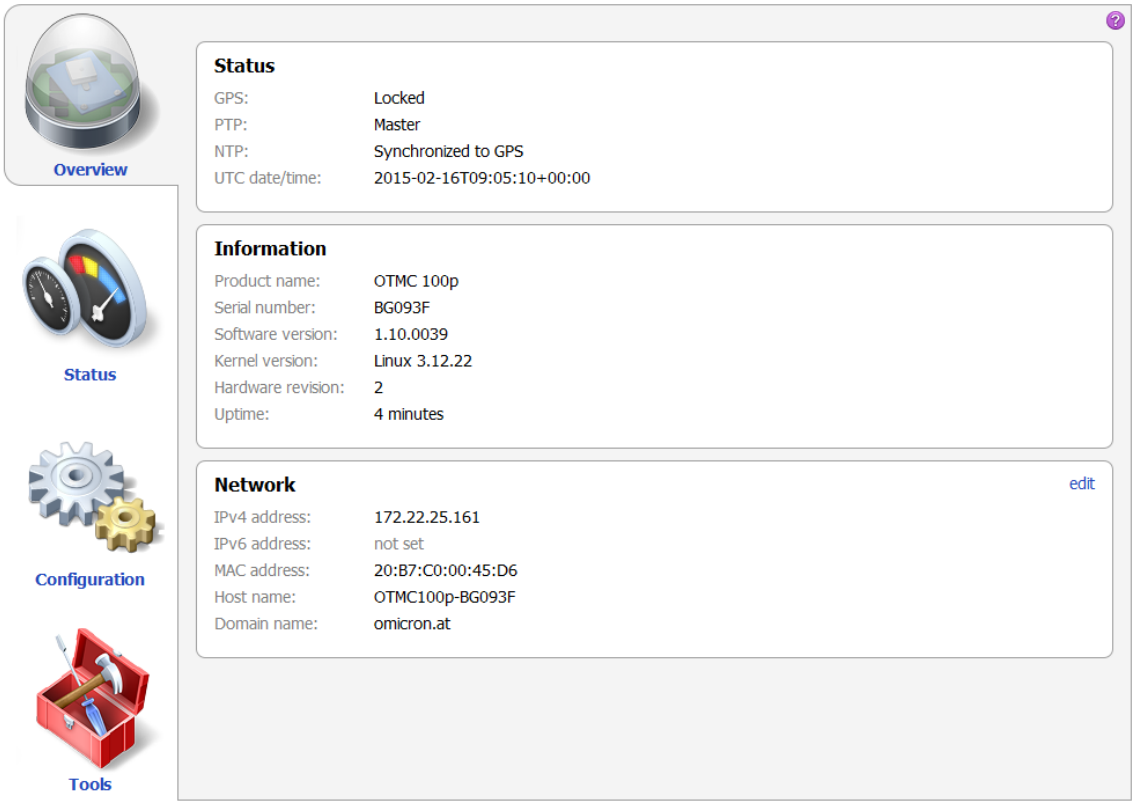
Click **Manual** in the top right corner to open this manual in PDF format.

Click **License Information** in the bottom right corner to view copyright and license information regarding open source products used in the *OTMC 100* software.

The Web Interface is divided into four main sections. Click an icon in the navigation bar on the left to access the corresponding pages.

	8.1 Overview (see page 40) This page provides an overview of the current settings and states of the *OTMC 100*.
	8.2 Status (see page 43) The **Status** pages provide detailed information about the GPS status (e.g. number of satellites, time and position) and the PTP, NTP and network status. An additional **Log Viewer** page shows all events logged in the internal log file.
	8.3 Configuration (see page 63) Use the **Configuration** pages to view and configure the network, security, PTP and NTP settings. You can furthermore configure the event logging and the e-mail notification function of the *OTMC 100*, and the SNMP settings.
	8.4 Tools (see page 91) Use these pages to perform a software upgrade for the *OTMC 100* or to perform a reboot or a factory reset for the device. You can furthermore download a system snapshot containing important information for the technical support in case of problems.

8.1 Overview



The **Overview** page provides an overview of the current settings and states of the *OTMC 100*.

If no password is defined for accessing the *OTMC 100*, a corresponding note is displayed providing the possibility to directly access the security configuration (see page 69) in order to enable password protection.

The **Overview** page displays the following information.

Status

GPS	Displays the current GPS status of the *OTMC 100*. Possible states are: Locked, holdover, unlocked. See GPS Status Page on page 44 for more information.
PTP	Displays the current PTP status of the *OTMC 100*. Possible states are: Master, passive, listening, disabled and faulty. See PTP Status Page on page 46 for more information.
NTP	Displays the current NTP status of the *OTMC 100*. Possible states are: Synchronized to GPS, synchronized to external server, nonsynchronous or disabled. See NTP Status Page on page 55 for more information.
UTC date/time	Displays the UTC date and time. The local time can be derived from the UTC time (Universal Time Coordinated) by adding or subtracting hours according to the specific time zone. For example, UTC plus one hour delivers the Central European Time CET (two hours during daylight saving time).

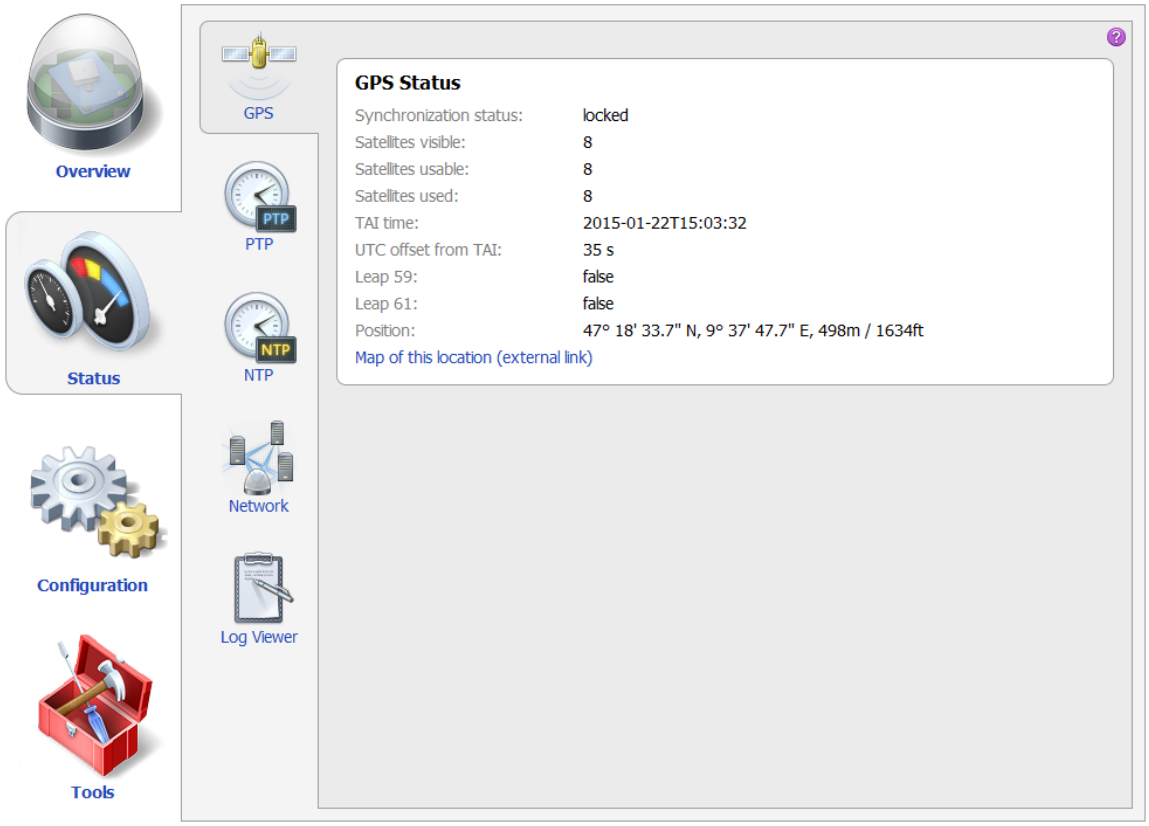
Information

Product name	Displays the exact product name.
Serial number	Displays the serial number of the *OTMC 100*.
Software version	Displays the software version currently installed on the *OTMC 100*.
Kernel version	Displays the kernel version used in the currently installed operating software.
Hardware revision	Displays the hardware version of the *OTMC 100*.
Uptime	Displays the time the *OTMC 100* is in operation since the last power-up.

Network

IPv4 address	Displays the currently assigned IPv4 address of the *OTMC 100*. If configured dynamically, the IP address is assigned automatically by a IPv4 DHCP server (if available in the network) or the *OTMC 100* itself. The IPv4 address can also be set manually by the user. See also Network Configuration Page on page 64.
IPv6 address	Displays the currently assigned IPv6 address of the *OTMC 100*. If configured dynamically and a IPv6 router is available in the network, the IP address is assigned automatically. The IPv6 address can also be set manually by the user. See also Network Configuration Page on page 64.
MAC address	Displays the unique MAC address (Media Access Control Address) of the *OTMC 100*.
Hostname	Displays the hostname of the *OTMC 100*. The default hostname is a combination of the device type and the serial number separated by dash, for example: OTMC100p-AA001A, and can be changed by the user. The serial number is available on the type plate on the bottom side of the *OTMC 100* (labeled "SerNo"). See also Network Configuration Page on page 64.
Domain name	Displays the domain name set by the user (e.g.: omicron.at). See also Network Configuration Page on page 64.

8.2 Status

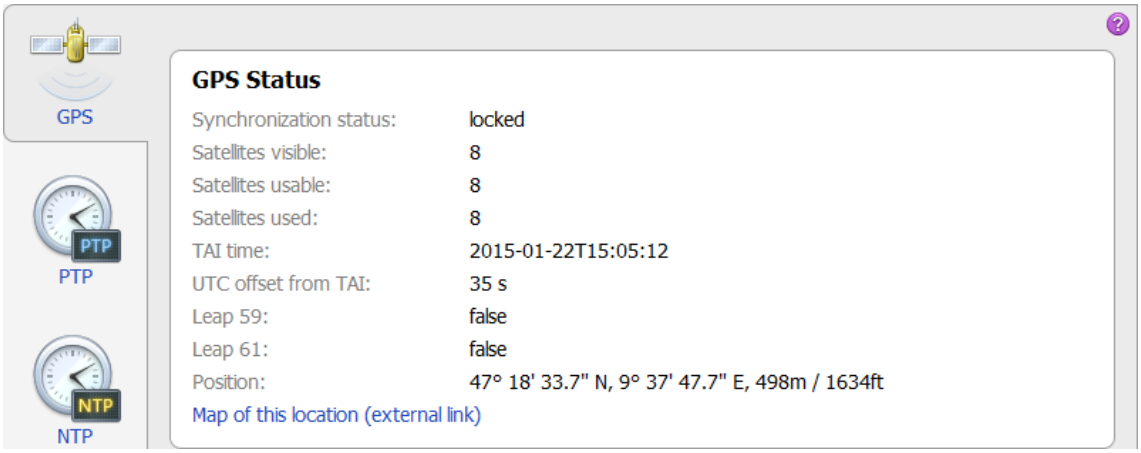


The following status pages are available:

GPS (see page 44)	**PTP** (see page 46)	**NTP** (see page 55)	**Network** (see page 58)	**Log Viewer** (see page 61)

Some elements provide an **edit** hyperlink. Click this hyperlink to directly open the corresponding Configuration on page 63.

8.2.1 GPS Status Page

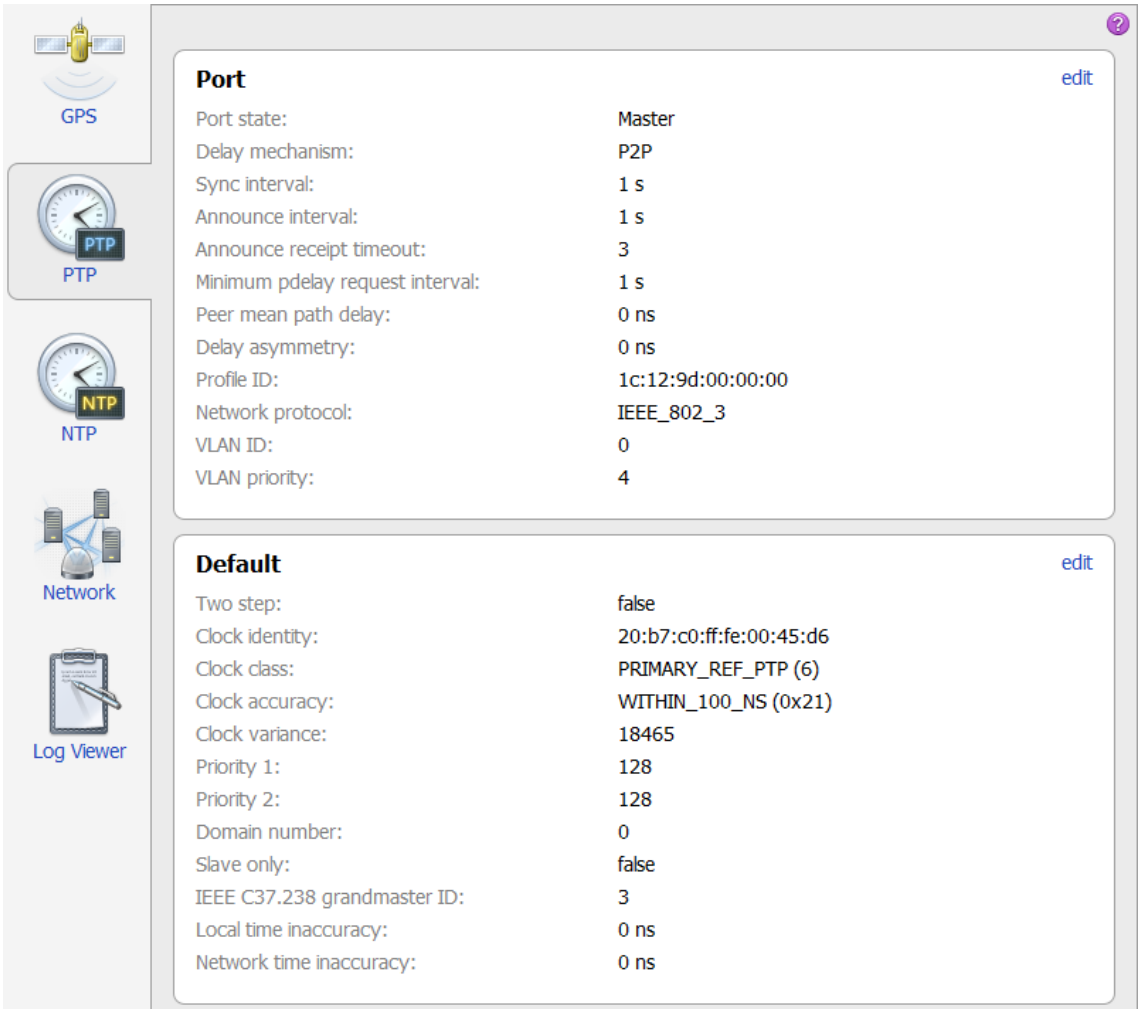


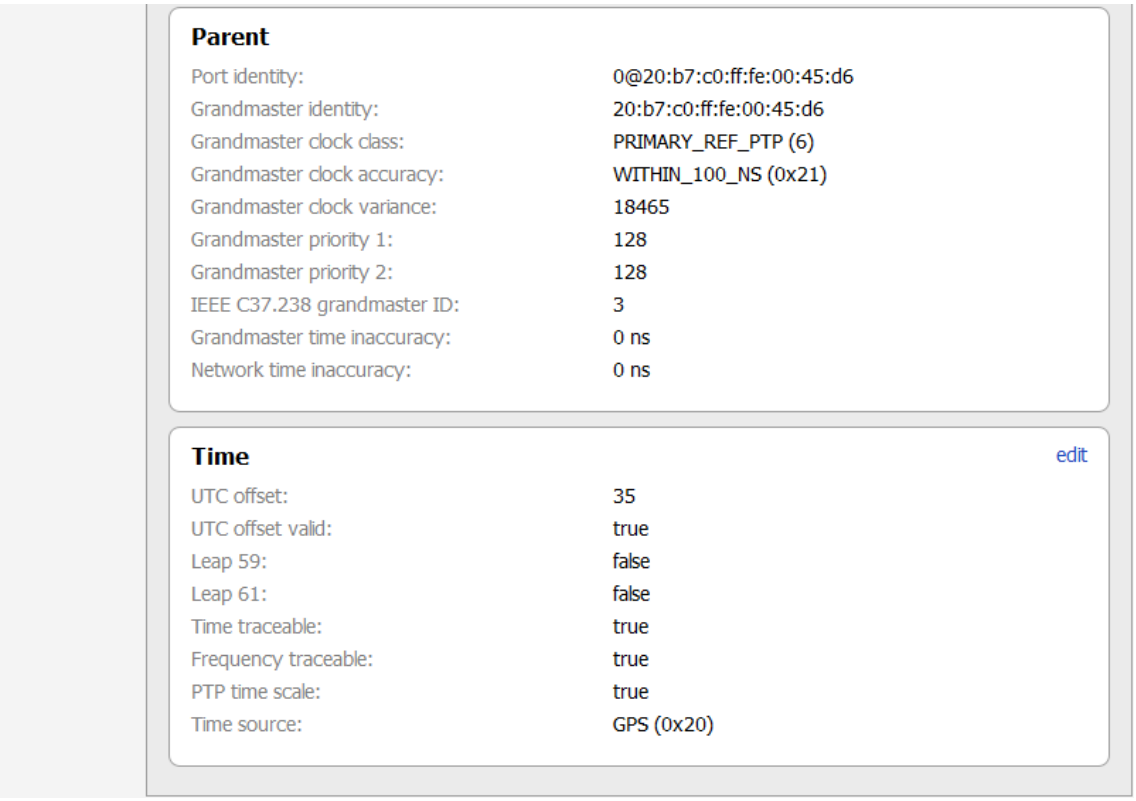
The **GPS** status page displays the following information:

Synchronization status	Displays the current GPS status of the *OTMC 100*: **Locked**: The internal clock is synchronized and controlled by GPS satellites. The *OTMC 100* is able to provide GPS synchronized time. **Holdover**: The *OTMC 100* will enter this state if was in the locked state before and then temporarily looses time synchronization with GPS satellites. In the holdover state, the device is still able to provide time information with possibly reduced accuracy for a certain time. **Unlocked**: The internal clock is not synchronized with GPS satellites. The *OTMC 100* is not able to provide time information.
Satellites visible	Displays the number of satellites the *OTMC 100* can "see" in the sky.
Satellites usable	Displays the number of satellites from which the *OTMC 100* can receive signals with sufficient quality. The *OTMC 100* requires at least 4 "useable" satellites.

Satellites used	Displays the number of satellites actually used by the *OTMC 100* for time synchronization and position determination.
TAI time	Displays the date and time according to the International Atomic Time (TAI). TAI is the basis for UTC with the difference that UTC is occasionally adjusted by adding a leap second (in order to keep the difference between UTC and UT1 lower than 0.9 seconds).
UTC offset from TAI	Displays the difference of UTC with regard to TAI.
Position	Displays the position coordinates (latitude and longitude) in degrees, minutes and seconds, and the height in meters and feet.
Leap 59 and Leap 61	Displays the leap second information as received by the GPS receiver of the *OTMC 100*.

8.2.2 PTP Status Page





The information in the **PTP** status page is displayed in four panes.

8.2.2.1 Port pane

The **Port** pane displays information on the current state and configuration of the PTP port of the *OTMC 100*. The data listed here correspond to the Port Dataset specified in IEEE 1588-2008, clause 8.2.5.

Port state	Displays the current PTP state of the network port of the *OTMC 100*. Possible states are: Master, passive, listening, disabled, faulty. **Master**: The *OTMC 100* is the best master clock in the network (according to the BMCA) and is thus used as time reference (PTP grandmaster clock). ...

Port state (cont.)	**Passive**: Another PTP clock in the network is the best master clock according to the BMCA (e.g., has a higher priority or provides more accurate time). Therefore, the other clock is used as time reference in the network. **Listening**: After initialization the *OTMC 100* is listening for messages from other PTP master clocks in the network before it becomes either master or passive. **Disabled**: The PTP state machine of the *OTMC 100* has been disabled via the management interface. **Faulty**: The *OTMC 100* detected a fault condition. Further details about the error can be found in the log file. See IEEE 1588-2008, clause 9.2.5 for more detailed information.
Delay mechanism	Displays which PTP delay mechanism is currently used by the *OTMC 100*. The value of this parameter may either be **E2E** (end-to-end) or **P2P** (peer-to-peer). The PTP delay mechanism used depends on the PTP profile selected in the PTP configuration (see page 75).
Sync interval [s]	Displays the mean synchronization interval for multicast messages (interval between successive Sync messages). This parameter is set in the PTP configuration (see page 75). Sync Interval = $2^{\text{Log sync interval}}$ seconds, see IEEE 1588-2008, clause 8.2.5.4.3.
Announce interval [s]	Displays the mean time interval between successive Announce messages. See IEEE 1588-2008, clause 8.2.5.4.1. This parameter is set in the PTP configuration (see page 75). Announce interval = $2^{\text{Log announce interval}}$ seconds.
Announce receipt timeout	Displays the number of "Announce Interval" intervals that have to pass without the receipt of an Announce message before an ANNOUNCE_RECEIPT_TIMEOUT_EXPIRES event occurs. See IEEE 1588-2008, clause 8.2.5.4.2. This parameter is set in the PTP configuration (see page 75).
Minimum pdelay request interval [s]	Displays the minimum permitted mean time interval between successive Pdelay_Req messages. See "logMinPdelayReqInterval" in IEEE 1588-2008. *Only available for Default P2P profile and Power Profile!* ...

Minimum pdelay request interval [s] (cont.)	This parameter is set in the PTP configuration (see page 75). Minimum pdelay request interval = $2^{\text{Log min pdelay request interval}}$ seconds, see IEEE 1588-2008, clause 8.2.5.4.5.
Minimum delay request interval [s]	Displays the minimum permitted mean time interval between successive Delay_Req messages. This value is determined and advertised by a master clock based on the ability of the master. *Only available for PTP profile "Default E2E"!* This parameter is set in the PTP configuration (see page 75). Minimum delay request interval = $2^{\text{Log min delay request interval}}$ seconds, see IEEE 1588-2008, clause 8.2.5.3.2.
Peer mean path delay [ns]	Displays the estimate of the current one-way propagation delay on the link computed using the peer delay mechanism. If the delay mechanism is E2E, this value is zero. See IEEE 1588-2008, clause 8.2.5.3.3.
Delay asymmetry [ns]	Displays the asymmetry delay. The asymmetry delay is defined to be positive when the master-to-slave or responder-to-requestor propagation time is longer than the slave-to-master or requestor-to-responder propagation time. See IEEE 1588-2008, clause 7.4.2. Time (master -> slave) = meanPathDelay + delayAsymmetry Time (slave -> master) = meanPathDelay - delayAsymmetry
Profile ID	Displays the profile identity. The profile identity identifies the PTP profile implemented by the port indicated by the targetPortIdentity.portNumber member of the field. See IEEE 1588-2008, clause 15.5.3.1.2.10.
Network protocol	Displays the network protocol selected for the Transport parameter in the PTP configuration (see page 75). Possible values are "UDP_IP_V4" (transport via UDP packets over IPv4), "UDP_IP_V6" (transport of the PTP packets via UDP over IPv6), and IEEE_802_3 (transport via Ethernet packets according to IEEE 802.3).
VLAN ID	Displays the VLAN ID. The Power Profile according to IEEE C37.238-2011 requires an IEEE 802.1Q VLAN tag. This value represents the VID (VLAN Identifier) field (12 bits) within the TCI (Tag Control Identifier). See IEEE C37.238-2011, clause 5.6. *Only available for Power Profile (OTMC 100p only).* This parameter is set in the PTP configuration (see page 75).

VLAN priority	Displays the VLAN priority. The Power Profile according to IEEE C37.238-2011 requires an IEEE 802.1Q VLAN tag. This value represents the PCP (Priority Code Point) field (3 bits) within the TCI (Tag Control Identifier). See IEEE C37.238-2011, clause 5.6. *Only available for Power Profile (OTMC 100p only).* This parameter is set in the PTP configuration (see page 75).

8.2.2.2 Default pane

The **Default** pane displays the current configuration/state of the internal PTP clock of the *OTMC 100*. When the *OTMC 100* is in the master state, the slave clocks in the network/domain in which the *OTMC 100* participates are synchronized to this clock. The data listed here correspond to the Default Dataset specified in IEEE 1588-2008, clause 8.2.1.

Two step	Indicates whether the *OTMC 100* is operating as a two step clock (true) or as a one step clock (false), see IEEE 1588-2008, clauses 7.3.8.3, 8.2.1.2.1 and 13.3.2.6. This parameter is set in the PTP configuration (see page 75).
Clock identity	Displays the clock identity. IEEE 1588-2008, clause 7.5.2.2, requires that each clock in a PTP network has a unique clock identifier. This identifier is an 8-octet array. The *OTMC 100* automatically sets the clock identity to a unique value based on the device's MAC address according to IEEE 1588-2008, clause 7.5.2.2.2.
Clock class	Displays the current clock class of the *OTMC 100* (see IEEE 1588-2008, clause 7.6.2.4). The clock class is broadcast in the corresponding PTP data packets. The value of the clock class parameter is automatically set by the *OTMC 100* depending on the source of time that is currently available: PRIMARY_REF_PTP (6) The clock of the *OTMC 100* is locked to a primary reference time source, i.e., to the GPS system. PRIMARY_REF_PTP_HOLDOVER (7) The clock was previously locked to GPS time but has lost GPS reception. The internal oscillator of the *OTMC 100* is used as the source of time and provides time with the accuracy given by the Clock accuracy parameter. ...

Clock class (cont.)	NOT_IN_SPEC_PTP_A (52) The clock is not locked to GPS time and is not within its holdover specification.
Clock accuracy	Displays the current accuracy of the *OTMC 100*'s internal clock with regard to TAI. See IEEE 1588-2008, clause 7.6.2.5 for details. This parameter is determined automatically by the *OTMC 100*, considering the quality of the current GPS reception.
Clock variance	Displays the clock variance. The clock variance parameter is set to the PTP variance value specified by IEEE 1588-2008, clause 7.6.3. This parameter gives a measure for the stability of the internal oscillator of the *OTMC 100* and is used in the Best Master Clock Algorithm (BMCA) of the PTP protocol. The Clock variance of the *OTMC 100* is set to a constant value that was determined from laboratory observations.
Priority 1 Priority 2	Displays the priority values of the *OTMC 100*. To each PTP master clock, two priority values (Priority 1 and Priority 2) may be assigned by the user. If more than one PTP grandmaster clock is available in the network, a clock with a lower Priority 1 value will always be the preferred master clock over a clock with a higher Priority 1 value (see IEEE 1588-2008, clause 6.6.2.3). A value in the range from 0 to 255 may be assigned to the Priority 1 parameter (see IEEE 1588-2008, clause 7.6.2.2). The Priority 2 parameter (see IEEE 1588-2008, clause 7.6.2.3) is used if several devices have the same Priority 1 parameter value and the same clock quality (class, accuracy and variance). The Priority 2 parameter thus allows a finer grained ordering among otherwise equivalent clocks (see IEEE 1588-2008, clause 6.6.2.3). Lower values take precedence. These parameters are set in the PTP configuration (see page 75).
Domain number	Displays the domain number of the *OTMC 100*. The domain number specifies the PTP domain (see IEEE 1588-2008, clause 7.1) in which the *OTMC 100* participates. All clocks in a network that shall be synchronized to each other must participate in the same PTP domain, i.e., have the Domain number parameter set to the same value. This parameter is set in the PTP configuration (see page 75).
Slave only	Displays whether the clock is a slave-only clock (true) or not (false). See IEEE 1588-2008, clause 8.2.1.4.4.

IEEE C37.238 grandmaster ID	Displays the grandmaster identity of the *OTMC 100* to be transmitted in IEEE C37.238 TLV. By sending this ID, the *OTMC 100* identifies itself as a valid power profile grandmaster. A power profile slave will ignore all masters that do not provide a setting for this field. *Only available for Power Profile (OTMC 100p only).* This parameter is set in the PTP configuration (see page 75).
Local time inaccuracy [ns]	Displays the maximum time inaccuracy in ns that the device contributes to the network time inaccuracy. See IEEE C37.238-2011, clause 5.13. *Only available for Power Profile (OTMC 100p only).* This parameter is set in the PTP configuration (see page 75).
Network time inaccuracy [ns]	Displays the network time inaccuracy in ns to be transmitted in IEEE C37.238 TLV. See IEEE C37.238-2011, clause 5.13. *Only available for Power Profile (OTMC 100p only).* This parameter is set in the PTP configuration (see page 75).

8.2.2.3 Parent pane

The **Parent** pane displays information about the current grandmaster of the network/domain in which the *OTMC 100* operates. If the *OTMC 100* is currently the master of the network or domain, the values given here are identical to the values in the **Default pane** (see page 50) . Otherwise, information about the respective grandmaster clock is given here. The data corresponds to the Parent Dataset specified by IEEE 1588-2008, clause 8.2.3.

Port identity	Displays the port identity. This parameter states the port identity of the *OTMC 100* as defined by IEEE 1588-2008, clause 7.5.2, in the format portNumber@clockIdentity.
GM identity	Displays the grandmaster identity. This is the unique identifier of the clock that is currently the grandmaster clock of the network or domain in which the *OTMC 100* participates.
GM clock class	Displays the grandmaster clock class. This parameter specifies the current clock class of the current grandmaster clock in the network or domain (see IEEE 1588-2008, clause 7.6.2.4). The value of the GM clock class parameter is automatically set by the current grandmaster clock depending on the source of time that is currently available.

GM clock accuracy	Displays the current accuracy of the internal clock of the current grandmaster clock with regard to TAI. See IEEE 1588-2008, clause 7.6.2.5 for details.
GM clock variance	Displays the grandmaster clock variance. The GM clock variance parameter is set to the PTP variance value specified by IEEE 1588-2008, clause 7.6.3. This parameter gives a measure for the stability of the internal oscillator of the current grandmaster clock and is used in the Best Master Clock Algorithm (BMCA) of the PTP protocol.
GM priority 1 GM priority 2	Displays the priority 1 and 2 of the current grandmaster clock. If more than one PTP grandmaster clock is available in the network, a clock with a lower Priority 1 value will always be the preferred master clock over a clock with a higher Priority 1 value (see IEEE 1588-2008, clause 6.6.2.3). A value in the range from 0 to 255 may be assigned to the Priority 1 parameter (see IEEE 1588-2008, clause 7.6.2.2). The Priority 2 parameter (see IEEE 1588-2008, clause 7.6.2.3) is used if several devices have the same Priority 1 parameter value and the same clock quality (class, accuracy and variance). The Priority 2 parameter thus allows a finer grained ordering among otherwise equivalent clocks (see IEEE 1588-2008, clause 6.6.2.3). Lower values take precedence.
IEEE C37.238 grandmaster ID	Displays the grandmaster identity announced in IEEE C37.238 TLV. By sending this ID, the current grandmaster clock identifies itself as a valid power profile grandmaster. A power profile slave will ignore all masters that do not provide a setting for this field. *Only available for Power Profile (OTMC 100p only).*
GM time inaccuracy [ns]	Displays the maximum time inaccuracy in ns that the current grandmaster clock contributes to the network time inaccuracy. See IEEE C37.238-2011, clause 5.13. *Only available for Power Profile (OTMC 100p only).*
Network time inaccuracy [ns]	Displays the network time inaccuracy of the current grandmaster clock in ns announced in IEEE C37.238 TLV. See IEEE C37.238-2011, clause 5.13. *Only available for Power Profile (OTMC 100p only).*

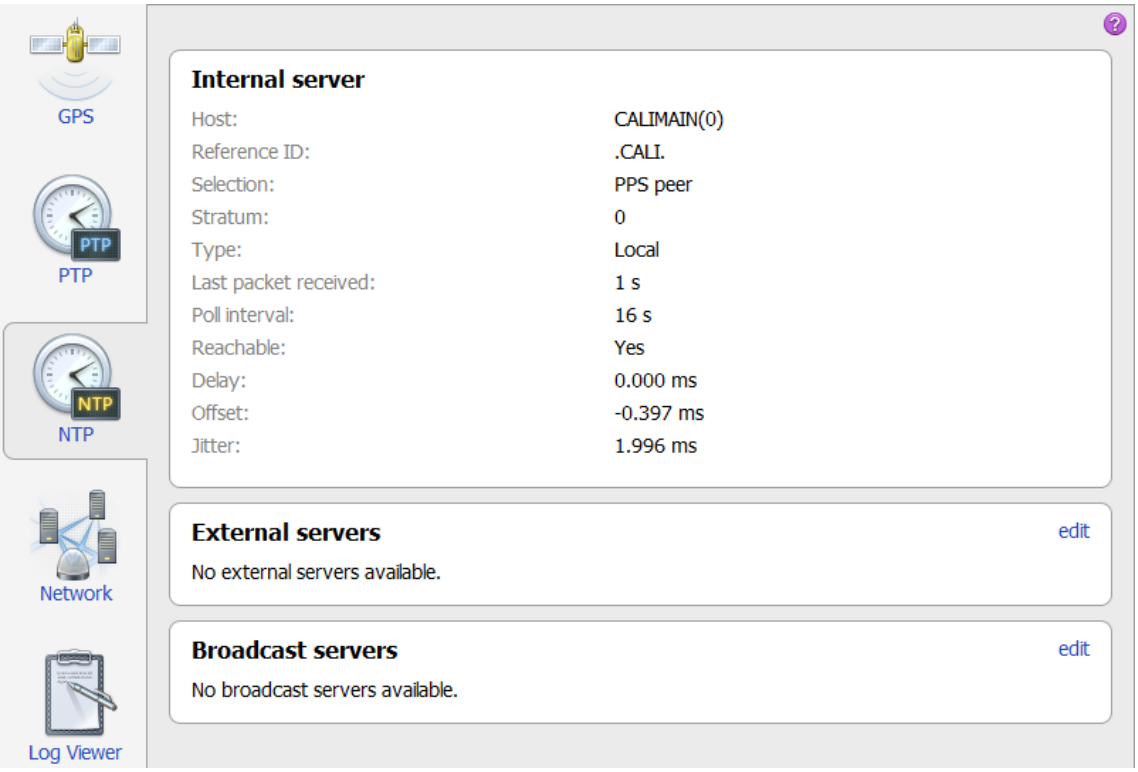
8.2.2.4 Time pane

The **Time** pane displays parameters for the time that is currently distributed in the PTP network or domain in which the *OTMC 100* participates (e.g., epoch related parameters like UTC offset or leap second information), and parameters of the time source currently used. If the *OTMC 100* is the current grandmaster of the network, the data in this pane represent its own time source. If the *OTMC 100* is in passive state, this pane lists the parameter values of the current grandmaster clock in the network or domain. The data listed here represents the Time Properties Data set specified in IEEE 1588-2008, clause 8.2.4.

UTC offset	Displays the UTC offset. In PTP systems whose epoch is the PTP epoch, the value is the offset between TAI and UTC in seconds; otherwise the value has no meaning. See IEEE 1588-2008, clause 8.2.4.2.
UTC offset valid	True indicates that the value of the UTC offset parameter is valid. Otherwise false. See IEEE 1588-2008, clause 8.2.4.3.
Leap 59 Leap 61	Displays the boolean values that are used to notify the clocks in the network or domain that a UTC leap second is pending. Leap 59 = True means that the last minute of the current UTC day contains only 59 seconds (see IEEE 1588-2008, clause 8.2.4.4). Leap 61 = True means that the last minute of the current UTC day contains 61 seconds (see IEEE 1588-2008, clause 8.2.4.5).
Time traceable	True indicates that the time currently distributed in the network or domain is traceable to a primary reference, e.g., to GPS (see IEEE 1588-2008, clause 8.2.4.6)
Frequency traceable	True indicates that the frequency determining the timescale currently distributed in the network or domain is traceable to a primary reference, e.g., to GPS (see IEEE 1588-2008, clause 8.2.4.7).
PTP time scale	True indicates that the timescale distributed in the network or domain is the PTP timescale, i.e., TAI time. False if an arbitrary timescale is used. See IEEE 1588-2008, clause 8.2.4.8. Example: GPS (0x20) means that the current grandmaster clock is synchronized to a satellite system like GPS.

Time source	Displays the source of time that is used by the current grandmaster clock (see IEEE 1588-2008, clause 8.2.4.9). Possible values for this parameter are listed in IEEE 1588-2008, clause 7.6.2.6.

8.2.3 NTP Status Page



The **NTP** status page displays status information for the local driver (**Internal** pane) as well as for the external servers and the broadcast/multicast servers configured in the NTP configuration (see page 81, **External** and **Broadcast** panes). Refer to the respective subsection below.

8.2.3.1 Internal pane

The **Internal** pane displays the current status information of the local driver. The local driver sets the system time to the PTP time if the GPS synchronization status is "locked" and the UTC offset is valid. Afterwards the system time is steered with a 1-PPS from the PTP clock.

Host	Displays the hostname (or IP number) of the peer.	
Reference ID	Displays the association ID or kiss code (kiss-o'-death).	
	Code	**Description**
	ACST	Manycast server
	AUTH	Authentication error
	AUTO	Autokey sequence error
	BCST	Broadcast server
	CALI	Local GPS time server
	CRYPT	Autokey protocol error
	DENY	Access denied by server
	INIT	Association initialized
	MCST	Multicast server
	RATE	Rate exceeded
	TIME	Association timeout
	STEP	Step time change
	XFAC	Interface has changed
Selection	Displays the current selection status of the peer.	
	NTPQ	**Description**
	' '	Discarded (not valid)
	'x'	Discarded (intersection)
	'.'	Discarded (table overflow)
	'-'	Discarded (cluster)
	'+'	Include (combine)
	'#'	Backup
	'*'	System peer
	'o'	PPS peer
Stratum	Displays the stratum of the peer (0 - 15).	
Type	Displays the type information of the peer.	
	NTPQ	**Description**
	'u'	Unicast
	'b'	Broadcast/multicast
	'l'	Local

Last packet received	Displays the time in seconds when the last packet was received.
Poll interval	Displays the poll interval in seconds.
Reachable	Displays whether the peer is reachable or not ("yes" or "no").
Delay	Displays the round trip time of the query (in ms).
Offset	Displays the difference (in ms) between the reference time and the system clock.
Jitter	Displays the magnitude (in ms) of the jitter between several time queries.

8.2.3.2 External pane

The **External** pane displays the status information for the external servers configured in the NTP configuration (see page 81).

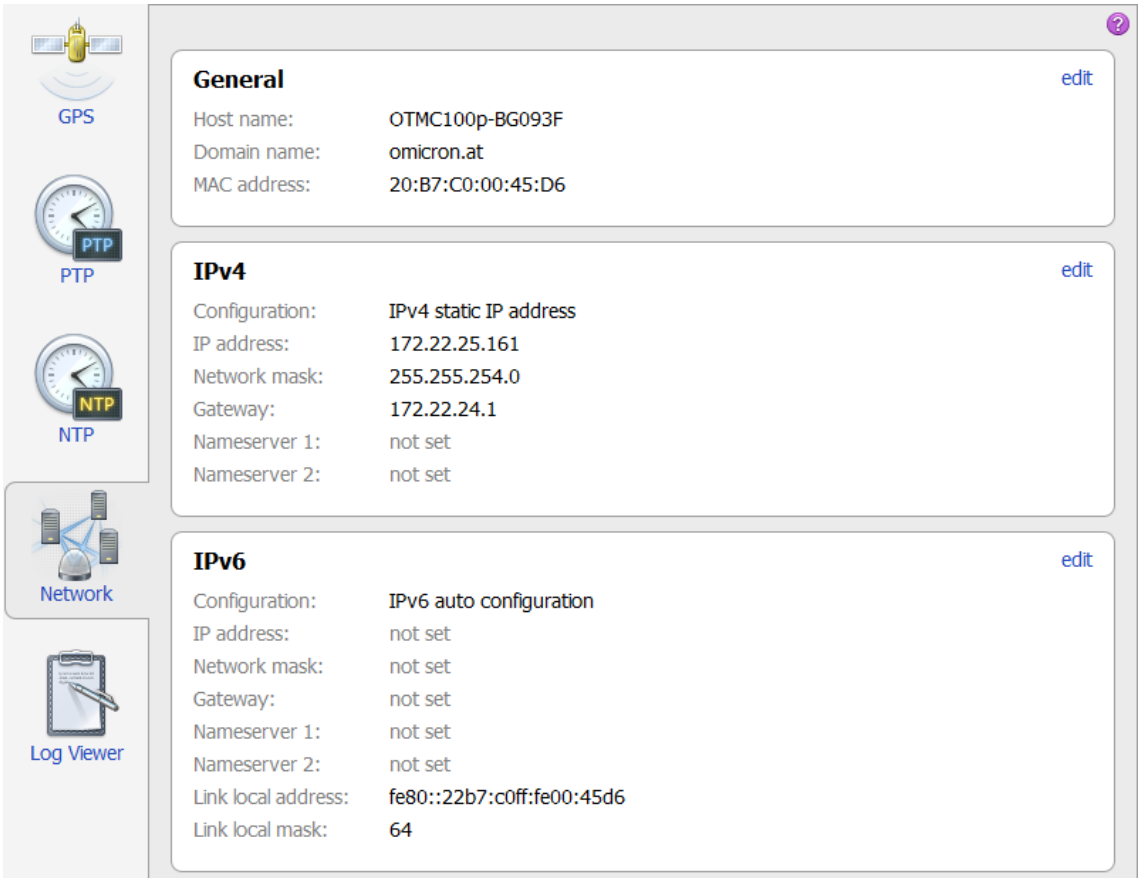
Please refer to the Internal pane section (see page 56) for a detailed description of the displayed information.

8.2.3.3 Broadcast pane

The **Broadcast** pane displays the **Host**, the **Reference ID**, the **Stratum** and the **Poll interval** for each broadcast/multicast server configured in the NTP configuration (see page 81).

Please refer to the Internal pane section (see page 56) for a detailed description of the displayed information.

8.2.4 Network Status Page



The **Network** status page shows detailed network settings of the *OTMC 100* in three panes. For information how to configure the network settings, see Network Configuration Page on page 64.

8.2.4.1 General pane

The **General** pane displays the general configuration settings of the *OTMC 100*.

MAC address	Displays the unique MAC address (Media Access Control Address) of the *OTMC 100*.
Domain name	Displays the domain name set by the user in the Network configuration, e.g. omicron.at (see page 64).
Hostname	Displays the hostname of the *OTMC 100*. The default hostname is a combination of the device type and the serial number separated by dash, for example: OTMC100p-AA001A, and can be changed by the user in the Network configuration (see page 64). The serial number is available on the type plate on the bottom side of the *OTMC 100* (labeled "SerNo").

8.2.4.2 IPv4 pane

The **IPv4** pane displays the IPv4 specific configuration settings of the *OTMC 100*. The IPv4 configuration is set in the Network configuration (see page 64).

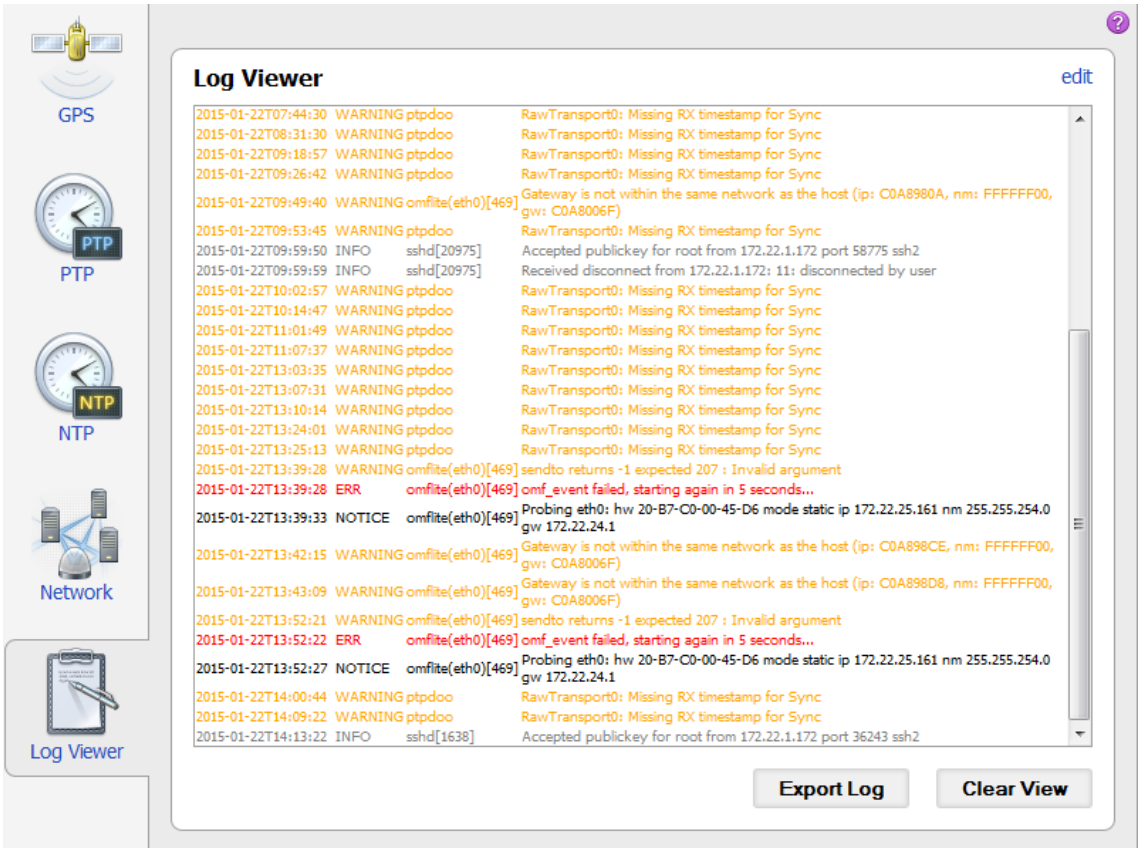
Configuration	Displays the configuration method selected for IPv4. **IPv4 disabled**: IPv4 is switched off. **IPv4 static IP address**: The IP address was assigned manually by the user. **IPv4 DHCP on**: The IP address was assigned automatically by a DHCP server.
IP address	Displays the currently assigned IPv4 address of the *OTMC 100* (e.g.: 192.168.1.100).
Network mask	Displays the network mask in dot-decimal notation (e.g.: 255.255.255.0).
Gateway	If set, this parameter displays the gateway address in dot-decimal notation (e.g.: 192.168.1.1).
Name server 1 Name server 2	If set, these parameters display the address of the first and second name server selected in dot-decimal notation (e.g.: 192.168.1.50).

8.2.4.3 IPv6 pane

The **IPv6** pane displays the IPv6 specific configuration settings of the *OTMC 100*. The IPv6 configuration is set in the Network configuration (see page 64).

Configuration	Displays the configuration method selected for IPv6. **IPv6 disabled**: IPv6 is switched off. **IPv6 static IP address**: The IP address was assigned manually by the user. **IPv6 auto configuration**: The IP address was assigned automatically using the Stateless Address Autoconfiguration (SLAAC). **IPv6 auto configuration (manual DNS)**: The IP address was assigned automatically using the Stateless Address Autoconfiguration (SLAAC), but the user manually specified possible DNS servers in the Network configuration (see page 64).
IP address	Displays the currently assigned IPv6 address of the *OTMC 100*.
Network mask	Displays the network mask in dot-decimal notation.
Gateway	If set, this parameter displays the gateway address in hexadecimal notation.
Name server 1 Name server 2	If set, these parameters display the address of the first and second name server in hexadecimal notation.
Link local address Link local mask	Displays the link local address and the respective mask automatically assigned by the Stateless Address Autoconfiguration (SLAAC) if the IPv6 auto configuration option is selected in the IPv6 Network configuration (see page 64).

8.2.5 Log Viewer Page


GPS
PTP
PTP
NTP
NTP
Network
Log Viewer
Log Viewer
edit
2015-01-22T07:44:30 WARNING ptpdoo RawTransport0: Missing RX timestamp for Sync
2015-01-22T08:31:30 WARNING ptpdoo RawTransport0: Missing RX timestamp for Sync
2015-01-22T09:18:57 WARNING ptpdoo RawTransport0: Missing RX timestamp for Sync
2015-01-22T09:26:42 WARNING ptpdoo RawTransport0: Missing RX timestamp for Sync
2015-01-22T09:49:40 WARNING omflite(eth0)[469] Gateway is not within the same network as the host (ip: C0A8980A, nm: FFFFFF00, gw: C0A8006F)
2015-01-22T09:53:45 WARNING ptpdoo RawTransport0: Missing RX timestamp for Sync
2015-01-22T09:59:50 INFO sshd[20975] Accepted publickey for root from 172.22.1.172 port 58775 ssh2
2015-01-22T09:59:59 INFO sshd[20975] Received disconnect from 172.22.1.172: 11: disconnected by user
2015-01-22T10:02:57 WARNING ptpdoo RawTransport0: Missing RX timestamp for Sync
2015-01-22T10:14:47 WARNING ptpdoo RawTransport0: Missing RX timestamp for Sync
2015-01-22T11:01:49 WARNING ptpdoo RawTransport0: Missing RX timestamp for Sync
2015-01-22T11:07:37 WARNING ptpdoo RawTransport0: Missing RX timestamp for Sync
2015-01-22T13:03:35 WARNING ptpdoo RawTransport0: Missing RX timestamp for Sync
2015-01-22T13:07:31 WARNING ptpdoo RawTransport0: Missing RX timestamp for Sync
2015-01-22T13:10:14 WARNING ptpdoo RawTransport0: Missing RX timestamp for Sync
2015-01-22T13:24:01 WARNING ptpdoo RawTransport0: Missing RX timestamp for Sync
2015-01-22T13:25:13 WARNING ptpdoo RawTransport0: Missing RX timestamp for Sync
2015-01-22T13:39:28 WARNING omflite(eth0)[469] sendto returns -1 expected 207 : Invalid argument
2015-01-22T13:39:28 ERR omflite(eth0)[469] omf_event failed, starting again in 5 seconds...
2015-01-22T13:39:33 NOTICE omflite(eth0)[469] Probing eth0: hw 20-B7-C0-00-45-D6 mode static ip 172.22.25.161 nm 255.255.254.0 gw 172.22.24.1
2015-01-22T13:42:15 WARNING omflite(eth0)[469] Gateway is not within the same network as the host (ip: C0A898CE, nm: FFFFFF00, gw: C0A8006F)
2015-01-22T13:43:09 WARNING omflite(eth0)[469] Gateway is not within the same network as the host (ip: C0A898D8, nm: FFFFFF00, gw: C0A8006F)
2015-01-22T13:52:21 WARNING omflite(eth0)[469] sendto returns -1 expected 207 : Invalid argument
2015-01-22T13:52:22 ERR omflite(eth0)[469] omf_event failed, starting again in 5 seconds...
2015-01-22T13:52:27 NOTICE omflite(eth0)[469] Probing eth0: hw 20-B7-C0-00-45-D6 mode static ip 172.22.25.161 nm 255.255.254.0 gw 172.22.24.1
2015-01-22T14:00:44 WARNING ptpdoo RawTransport0: Missing RX timestamp for Sync
2015-01-22T14:09:22 WARNING ptpdoo RawTransport0: Missing RX timestamp for Sync
2015-01-22T14:13:22 INFO sshd[1638] Accepted publickey for root from 172.22.1.172 port 36243 ssh2
Export Log
Clear View

The **Log Viewer** page shows all events logged in the internal log file.

Which types of events are actually logged by the system can be selected in the Log & Notification configuration (see page 85).

ERR Error messages are displayed in red.

WARNING Warning messages are displayed in orange.

NOTICE Notice messages are displayed in black.

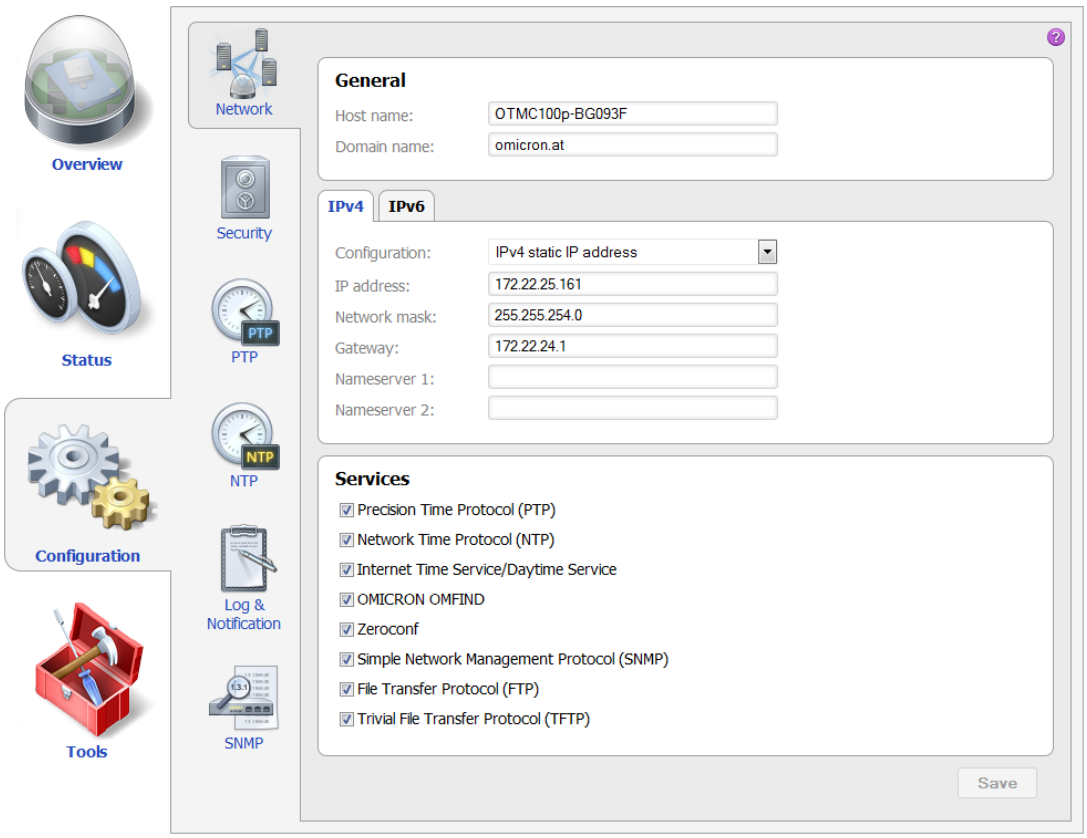
INFO All other messages (debug messages, information, etc.) are displayed in gray.

Click **Clear View** to delete the messages displayed in the **Log Viewer** window. This does not clear the log file. Re-opening the **Log Viewer** will again display all messages logged in the log file.

Click **Export Log** to export the log file content to a text file (file extension .log).

The log file is saved in the persistent memory of the *OTMC 100*. If the maximum size of the log file is reached, the system automatically deletes old log file entries in order to release memory space for new entries.

8.3 Configuration



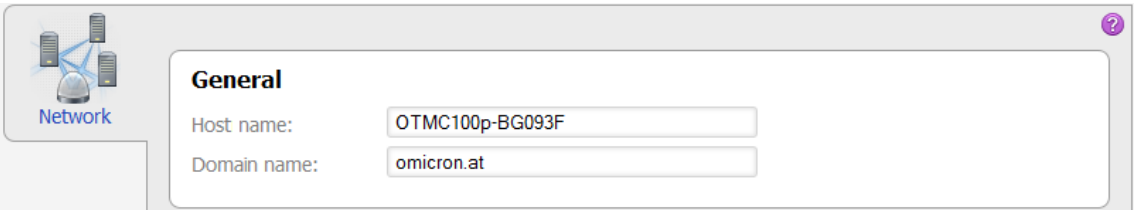
The following configuration pages are available.

Network (see page 64)	**Security** (see page 69)	**PTP** (see page 75)
NTP (see page 81)	**Log & Notifications** (see page 85)	**SNMP** (see page 88)

8.3.1 Network Configuration Page

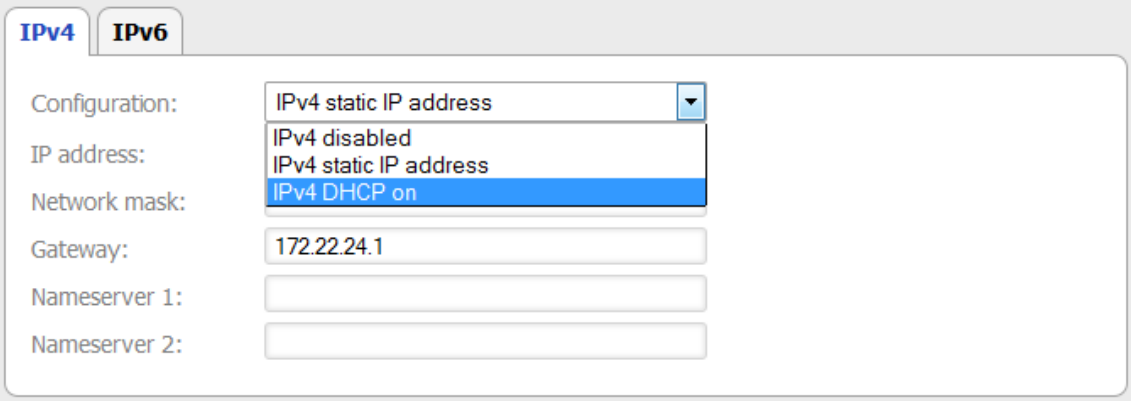
Select the corresponding pane to specify your network configuration settings. Click the **Save** button to save and apply your network configuration specified in the individual tabs to the *OTMC 100*.

8.3.1.1 General pane



Hostname	Hostname (device name) of the *OTMC 100*. The hostname is set to the serial number by default but can be changed by the user.
Domain name	If a DHCP server is available in the network, the *OTMC 100* receives the domain name from the DHCP server. The domain name can also be set manually by the user (e.g.: omicron.at).

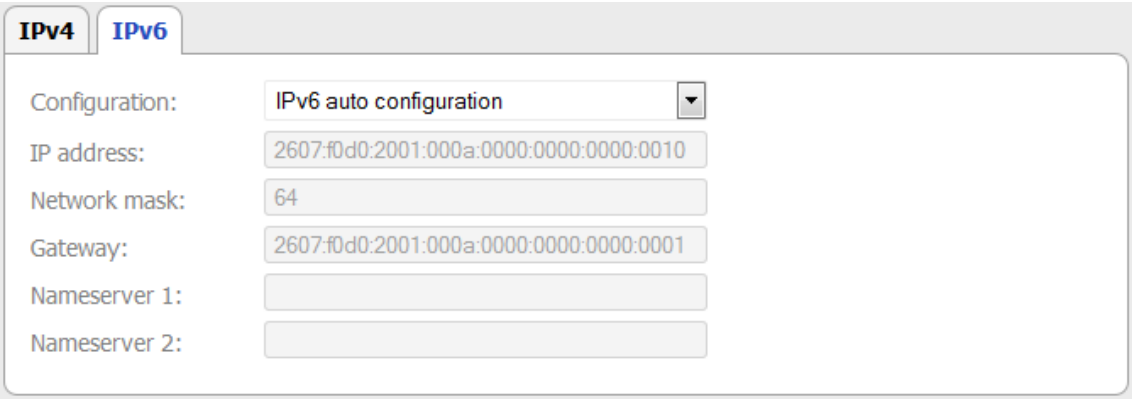
8.3.1.2 IPv4 tab



Click this tab to configure the IPv4 settings according to your needs:

IPv4 disabled	IPv4 is switched off.
IPv4 static IP address	Select **Static** to set the IP address manually. The page then displays fields for entering the **IP address**, the **Network mask**, the **Gateway** address and the **Name server** address in dot-decimal notation (e.g.: 192.168.1.100).
IPv4 DHCP on	The IP address is assigned automatically by a IPv4 DHCP server (if available in the network) or the *OTMC 100* itself. The IP address assigned is displayed in the **Network Status Page page** on page 58 and the **Overview page** (see page 40).

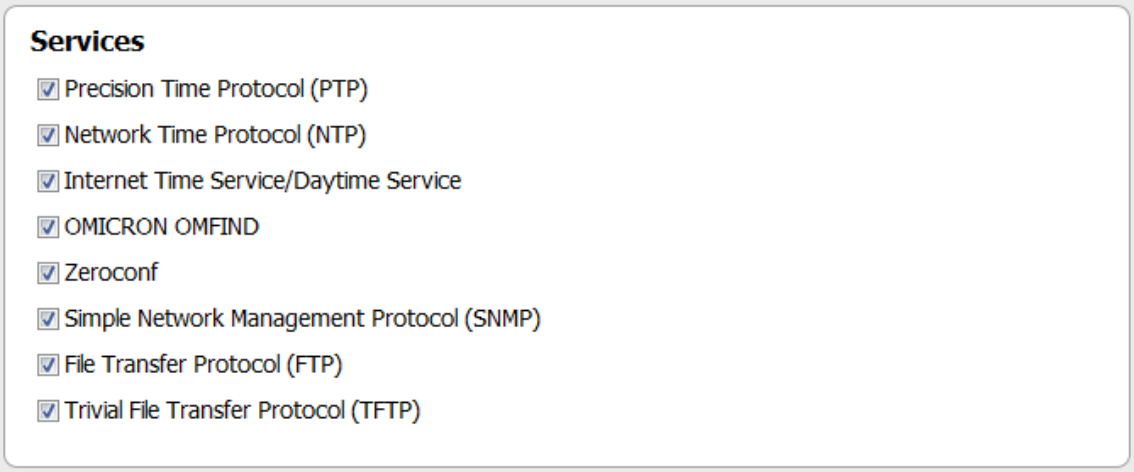
8.3.1.3 IPv6 tab



Click this tab to configure the IPv6 settings according to your needs:

IPv6 disabled	IPv6 is switched off.
IPv6 static IP address	Select **Static** to set the IP address manually. The page then displays fields for entering the **IP address**, the **Gateway** address and the **Name server** address in hexadecimal notation (e.g.: 2607:f0d0:2001:a::10), and the **Network mask** in decimal notation.
IPv6 auto configuration	The IP address is assigned automatically using the Stateless Address Autoconfiguration (SLAAC). The IP address assigned is displayed in the **Network Status Page page** on page 58 and the **Overview page** (see page 40). Additionally, the user has the option to manually specify DNS servers by selecting the **IPv6 auto configuration (manual DNS)** option and entering DNS server addresses to the **Name server** fields (in hexadecimal notation, e.g.: 2607:f0d0:2001:a::10).
IPv6 auto configuration (manual DNS)	

8.3.1.4 Services pane



Use this pane to enable or disable individual services and processes running on the *OTMC 100* system.

All services are enabled by default. Disabling services that are not used or required for your specific application will enhance the device security.

Precision Time Protocol (PTP)	Select the checkbox to enable PTP support (propagation of time information via PTP in the network).
Network Time Protocol (NTP)	Select the checkbox to enable NTP support (propagation of time information via NTP in the network).
Internet Time Service / Daytime Service	Select the checkbox to enable Time/Daytime support (propagation of time information via the Time and Daytime protocol).
OMICRON OMFIND	Select the checkbox to enable the Omicron OMFIND service. This service is used by the OMICRON Device Browser to automatically detect OMICRON devices in the network.

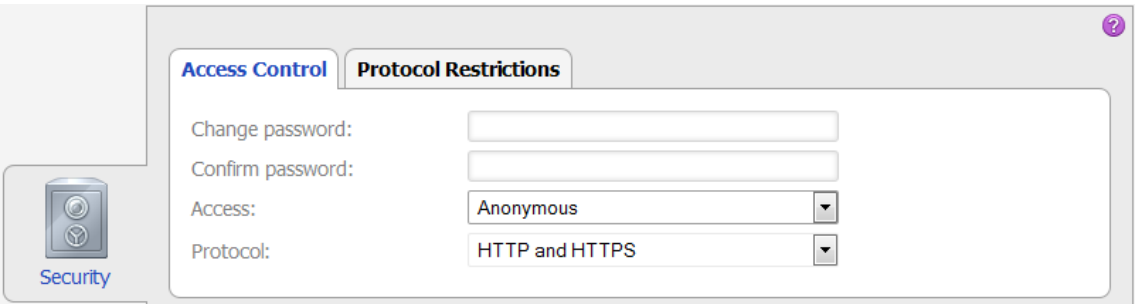
Zeroconf	Select the checkbox to enable detection of *OTMC 100* devices in the network by clients that are able to handle mDNS/DNS-SD (e.g., the Apple Bonjour tool, as an alternative to the OMFIND service used by the OMICRON Device Browser).
Simple Network Management Protocol (SNMP)	Select the checkbox to enable access via SNMP.
File Transfer Protocol (FTP)	Select the checkbox to enable access via FTP. The *OTMC 100* is able to provide FTP server functionality, which can be used for example to transfer a configuration file to the *OTMC 100*.
Trivial File Transfer Protocol (TFTP)	Select the checkbox to enable access via TFTP. The *OTMC 100* is able to provide TFTP server functionality, which can be used for example to download a configuration file from the *OTMC 100*.

8.3.2 Security Configuration Page

Use the **Security** page to configure the security of the *OTMC 100*. It is possible to activate password protection for accessing the *OTMC 100*, generate and define authentication certificates for accessing the *OTMC 100* via the secure HTTPS protocol and to disable remote configuration of the *OTMC 100*, for example via the OMICRON Device Browser or the PTP and SNMP management interfaces.

Select the corresponding pane to specify the security options to be used by the *OTMC 100*.

8.3.2.1 Access Control pane



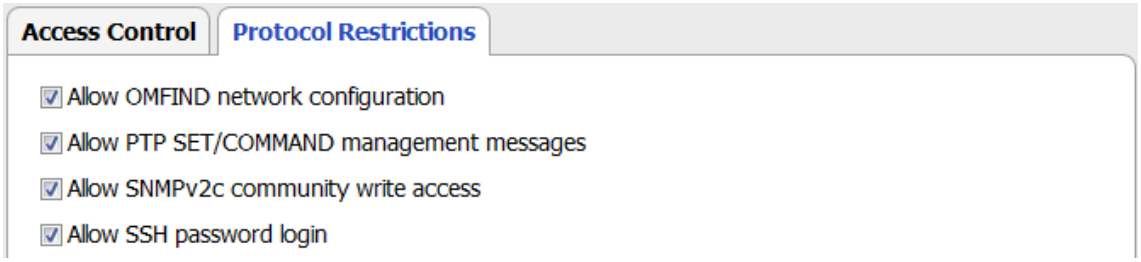
Use this pane to define password protection for accessing the *OTMC 100*.

Change password	Enter your password for accessing the *OTMC 100*. The *OTMC 100* uses the same password for all services and processes running on the *OTMC 100* (e.g., detection by OMICRON OMFIND service, FTP access, etc.) The password is case sensitive and must have at least 6 characters (letters, figures or special characters).
Confirm password	Repeat your password for confirmation.
Access	Select **Password** if you want to protect the *OTMC 100* against unauthorized access by specifying a password. Select **Anonymous** if you do not want to use password protection. If password protection is enabled, a login dialog appears when accessing the *OTMC 100* Web Interface. If you set the **Access** field to **Password** without defining a password, the default password *timeserver* will be used.

Protocol	Select **HTTP** and **HTTPs** if you want to allow access to the *OTMC 100* Web Interface via the HTTP protocol or the secure HTTPs protocol. Select **HTTPs only** if you want to allow access via the secure HTTPs protocol only.

Perform a factory reset on the device if you forgot your password (see 7.2 Operating Procedures Performed Directly on the Device on page 35). This will reset and deactivate password protection for the *OTMC 100*.

8.3.2.2 Protocol Restrictions pane



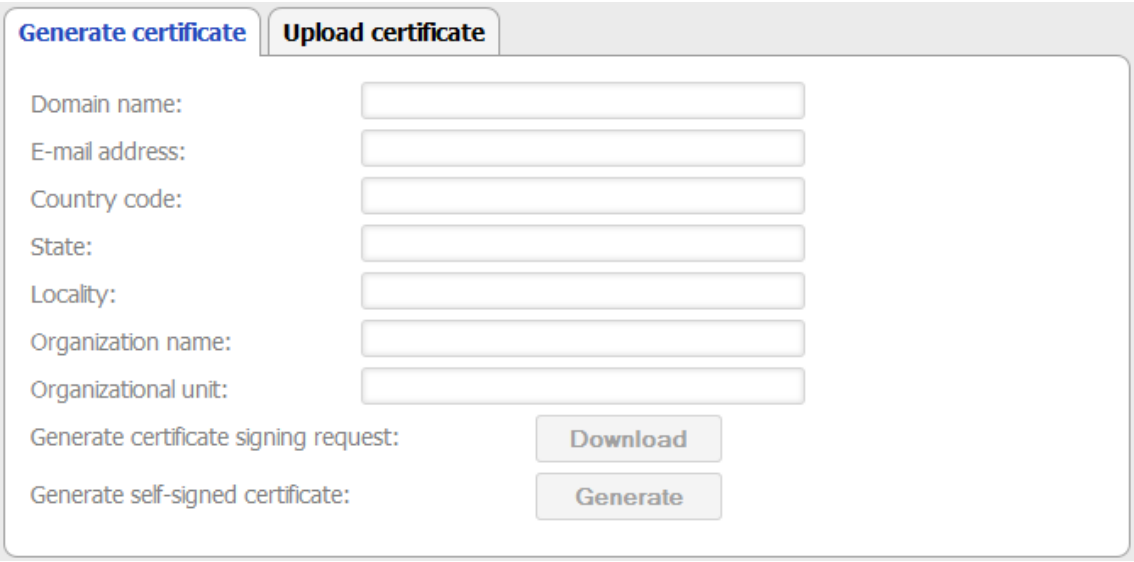
Use this pane to increase the security if you are using the *OTMC 100* in a network with high security demands. Deselecting services that are not required or used for operation makes the *OTMC 100* safer against any kind of attacks, for example performed to change the configuration. Deselecting all options will minimize potential points of attack and thus provide highest security.

Click the corresponding check box to select or deselect an option. All options are selected by default. Click the **Save** button to save and apply your protocol restrictions settings to the *OTMC 100*.

Allow OMFIND network configuration	The OMFIND service is used by the OMICRON Device Browser to automatically detect OMICRON devices in the network. However, the Device Browser also allows for changing the IP address of OMICRON devices available in the network. Deselect this option to prohibit IP address changes via the OMICRON Device Browser. If selected, changing the IP address via the Device Browser is possible.

Allow PTP SET/COMMAND management messages	Deselect this option to disable write access via the PTP management interface in order to prohibit configuration of the *OTMC 100* via the PTP management interface.
Allow SNMPv2c community write access	Deselect this option to disable write access via the SNMP management interface in order to prohibit configuration of the *OTMC 100* via the SNMP management interface.
Allow SSH password login	If this option is enabled, the user can log in to the *OTMC 100* via SSH using the standard user/password authentication (i.e., using the user name and password defined for the *OTMC 100*) or using a public/private key pair previously generated by the user and copied to the *OTMC 100*. Deselect this option to prohibit standard user/password authenticated access to the *OTMC 100* via secure shell (SSH). When deselected, access via SSH is only possible via key based authentication. Deselecting this option reduces the risk of unauthorized access to the *OTMC 100* through brute force attacks. There are numerous instructions for generating SSH key pairs on the Internet.

8.3.2.3 Generate Certificate pane



When accessing the *OTMC 100* via HTTPS, an "untrusted connection" message will appear because the *OTMC 100* does not have a valid certificate.

To avoid such messages, it is necessary to provide the *OTMC 100* with such a certificate. There are two possible ways: Generating a certificate signed by an accredited certification authority or generating a certificate signed by yourself.

Web browsers usually contain the digital signatures of all accredited certification authorities by default and will therefore accept certificates signed by those authorities. However, when using a self-signed certificate, the web browser will not recognize you as a valid certification authority (since it does not know the signature of "your" certification authority) and thus not accept such certificates. This behavior can only be eliminated by providing each web browser used to access the *OTMC 100* with the digital signature of "your" certification authority. Due to this, generating a self-signed certificate will in most cases not be a feasible solution in practice. We recommend to generate a certificate signed by an accredited certification authority or to accept the "untrusted connection" message displayed when accessing the *OTMC 100*.

Proceed as follows to generate a certificate signed by an accredited certification authority:

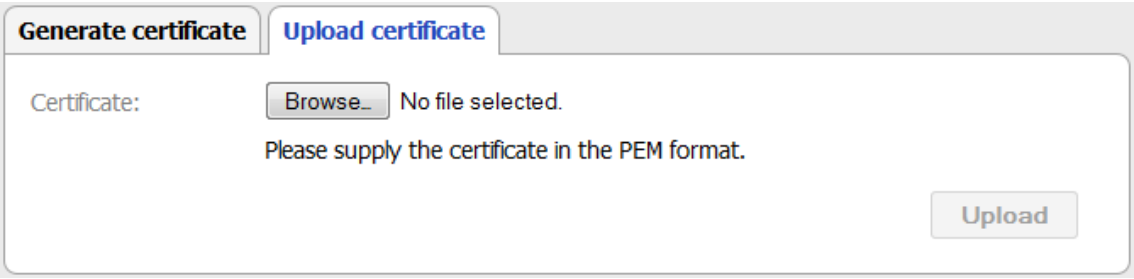
1. Enter the required information to the fields **Domain name**, **E-mail address**, **Country code** (e.g. AT), **State**, **Locality**, **Organization name** and **Organizational unit**.
2. Click the **Download** button next to **Generate certificate signing request** to generate a certificate and download it from the *OTMC 100*.
3. Send the certificate to an accredited certification authority.
4. Upload the signed certificate received from the certification authority to the *OTMC 100* using the **Upload Certificate** pane (see below).
5. The web browser will then recognize that the certificate has been signed by an accredited certification authority and therefore no longer display the "untrusted connection" message when accessing the *OTMC 100*.

Proceed as follows to generate a self-signed certificate:

1. Enter the required information to the fields **Domain name**, **E-mail address**, **Country code** (e.g. AT), **State**, **Locality**, **Organization name** and **Organizational unit**.
2. Click the **Generate** button next to **Generate self-signed certificate** to generate a certificate on the *OTMC 100* that is signed by yourself.
3. The *OTMC 100* automatically performs a restart of the web server.
4. The web browser then displays an "untrusted connection" message. Add the certificate previously generated for the *OTMC 100* to your web browser.

The approach to add the certificate to the web browser strongly depends on the browser used to access the *OTMC 100*. Please consult the help system of your web browser for a detailed description how to handle certificates with your browser.

8.3.2.4 Upload Certificate pane

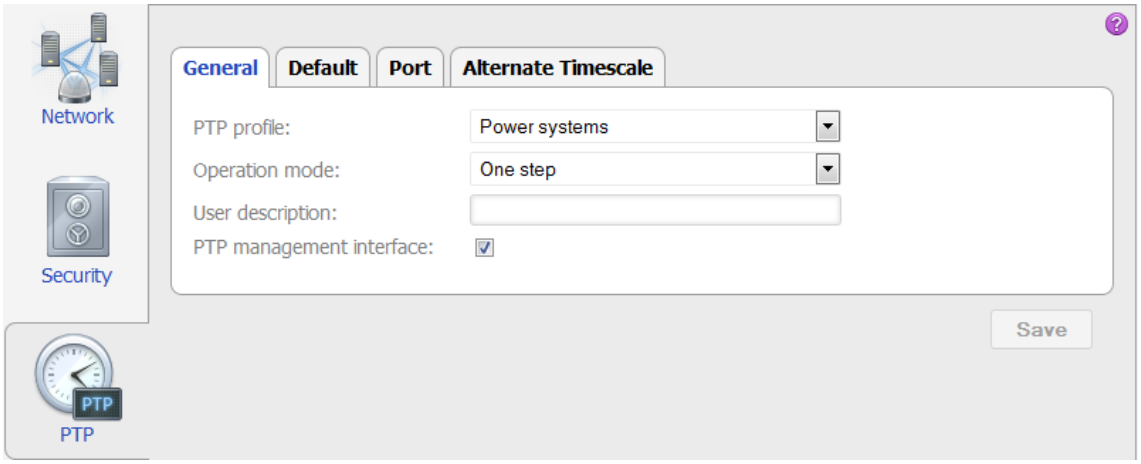


Click the **Browse...** button to navigate to the signed certificate (see above). The path and file name is displayed in the field after selecting it in the file open dialog. Then click the **Upload** button to upload the certificate to the *OTMC 100*.

8.3.3 PTP Configuration Page

Select the corresponding pane to specify your PTP configuration settings. Click the **Save** button to save and apply your PTP configuration specified in the individual tabs to the *OTMC 100*.

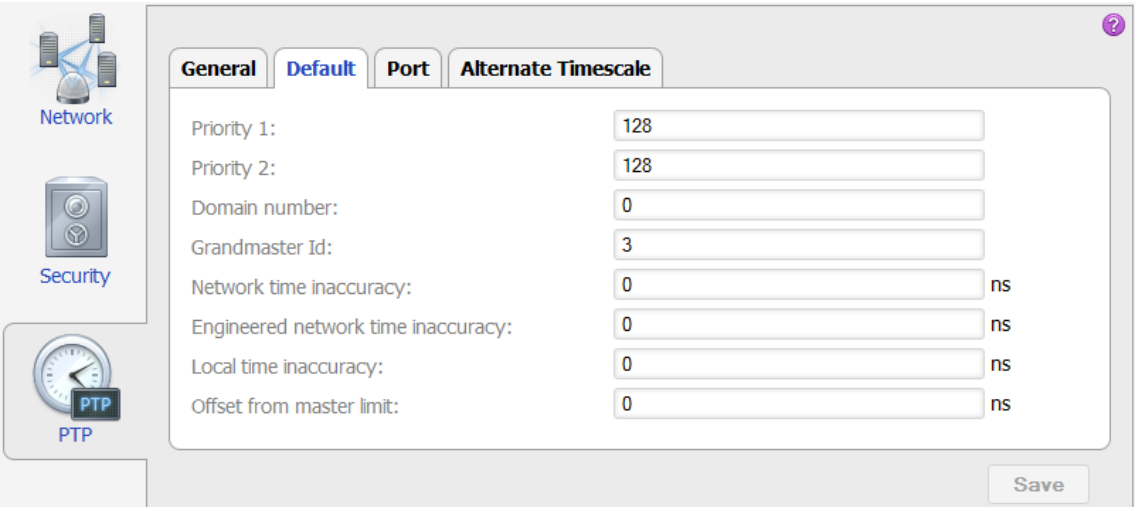
8.3.3.1 General pane



PTP profile	Use this list box to select the PTP profile. The Default E2E and PTP profiles are intended for application in industrial environments that use the IEEE 1588-2008 Precision Time Protocol. **Default E2E**: The default profile with the end-to-end mechanism as defined in IEEE 1588-2008 is used. **Default P2P**: The default profile with the peer-to-peer mechansim is used. **Power systems**: The Power Profile acc. to IEEE C37.238-2011 is intended for application in power system environments that use the Precision Time Protocol according to the IEEE Std. C37.238-2011 (IEEE Standard Profile for Use of IEEE 1588-2008 Precision Time Protocol in Power System Applications). *(OTMC 100p only.)*
Operation mode	Use this list box to select the operating mode for the PTP clock according to IEEE 1588-2008 (**One step** or **Two step**). ...

Operation mode (cont.)	One step is the recommended mode since this mode produces less network traffic. The two step mode should only be used if some equipment used in the network does not work correctly with the one step mode.
User description	Enter a description for the *OTMC 100*. This may be required to identify the *OTMC 100* uniquely if you are using more than one *OTMC 100* devices in the network.
PTP management interface	Select the check box to enable access via the PTP management interface.

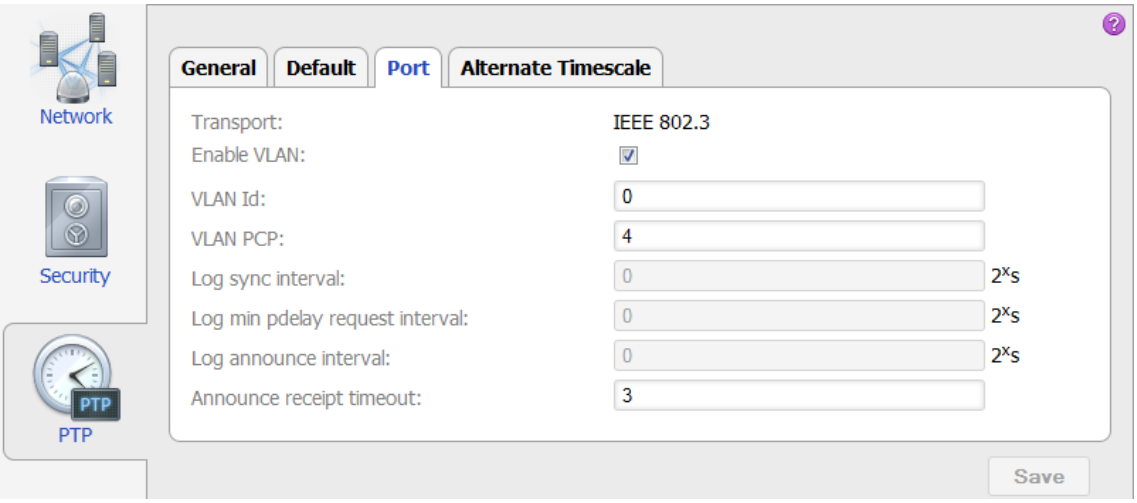
8.3.3.2 Default pane



Priority 1 Priority 2	Use this field to specify the priority values. To each PTP master clock, two priority values (Priority 1 and Priority 2) may be assigned by the user. If more than one PTP grandmaster clock is available in the network, a clock with a lower Priority 1 value will always be a preferred master clock over a clock with a higher Priority 1 value (see IEEE 1588-2008, clause 6.6.2.3). A value in the range from 0 to 255 may be assigned to the Priority 1 parameter (see IEEE 1588-2008, clause 7.6.2.2). ...

Priority 1, 2 (cont.)	The Priority 2 parameter (see IEEE 1588-2008, clause 7.6.2.3) is used if several devices have the same Priority 1 parameter value and the same clock quality (class, accuracy and variance). The Priority 2 parameter thus allows a finer grained ordering among otherwise equivalent clocks (see IEEE 1588-2008, clause 6.6.2.3). Lower values take precedence.
Domain number	Use this field to specify the domain number. The domain number specifies the PTP domain (see IEEE 1588-2008, clause 7.1) in which the *OTMC 100* participates. All clocks in a network that shall be synchronized to each other must participate in the same PTP domain, i.e., have the Domain number parameter set to the same value.
Grandmaster ID	Use this field to specify the grandmaster identity to be transmitted in IEEE C37.238 TLV. By sending this ID, the *OTMC 100* identifies itself as a valid power profile grandmaster. A power profile slave will ignore all masters that do not provide a setting for this field. *Only available for Power Profile (OTMC 100p only).*
Network time inaccuracy	Use this field to specify the network time inaccuracy in ns to be transmitted in IEEE C37.238 TLV. See IEEE C37.238-2011, clause 5.13. *Only available for Power Profile (OTMC 100p only).*
Engineered network time inaccuracy	Use this field to specify the engineered network time inaccuracy in ns. This value is set at the end device to represent the worst network time inaccuracy from this device to all preferred grandmasters. See "EngTimeInacc" in IEEE C37.238-2011. *Only available for Power Profile (OTMC 100p only).*
Local time inaccuracy	Use this field to specify the maximum time inaccuracy in ns that the device contributes to the network time inaccuracy. See IEEE C37.238-2011, clause 5.13. *Only available for Power Profile (OTMC 100p only).*
Offset from master limit	Use this field to specify the offset from master limit in ns to generate OfstExceedsLimit event. If this value is zero, no event is generated. See "OfstExceedsLimit" in IEEE C37.238-2011. *Only available for Power Profile (OTMC 100p only).*

8.3.3.3 Port pane

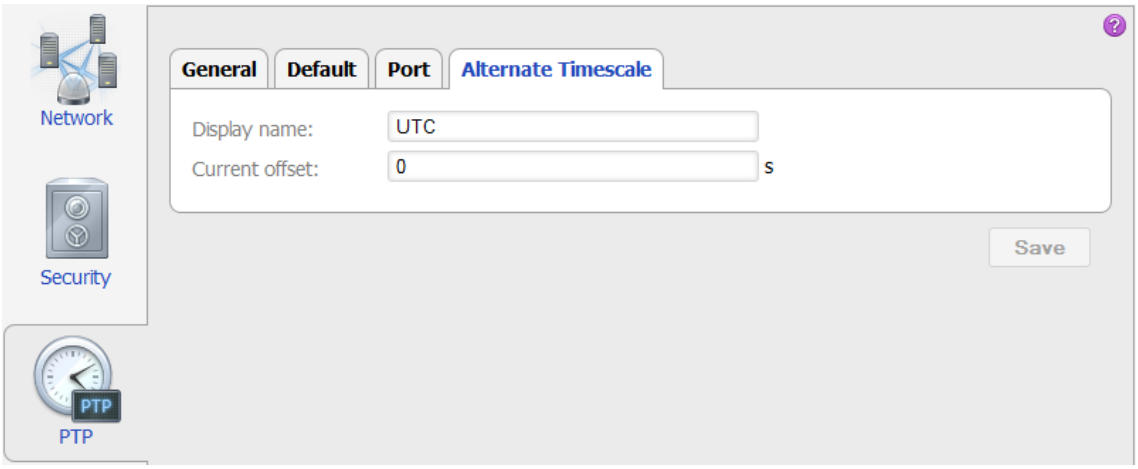


Transport	Select the transport mechanism (network protocol) from the list. The protocols available in the list depend on the PTP profile selected: **UDP IPv4**: User Datagram Protocol (UDP) for Internet Protocol (IP) version 4. *Only available for the default E2E and P2P profiles.* **UDP IPv6**: User Datagram Protocol (UDP) for Internet Protocol (IP) version 6. *Only available for the default E2E and P2P profiles.* **IEEE 802.3**: Ethernet protocol according to IEEE 802.3.
Enable VLAN	Use this field to enable the usage of VLAN tags for PTP packets. The Power Profile according to IEEE C37.238-2011 requires an IEEE 802.1Q VLAN tag. However, for compatibility reasons it is possible to disable it. *Only available for Power Profile (OTMC 100p only).*
VLAN ID	Use this field to specify the VLAN ID. The Power Profile according to IEEE C37.238-2011 requires an IEEE 802.1Q VLAN tag. This value represents the VID (VLAN Identifier) field (12 bits) within the TCI (Tag Control Identifier). See "VlanId" in IEEE C37.238-2011. *Only available for Power Profile (OTMC 100p only).*

VLAN PCP	Use this field to specify the VLAN PCP. The Power Profile according to IEEE C37.238-2011 requires an IEEE 802.1Q VLAN tag. This value represents the PCP (Priority Code Point) field (3 bits) within the TCI (Tag Control Identifier). *Only available for Power Profile (OTMC 100p only).*
Log sync interval	Use this field to specify the logarithm to the base 2 of the mean synchronization interval (interval between successive Sync messages in 2^x seconds) for multicast messages. See "logSyncInterval" in IEEE 1588-2008. For example, a value of 2 will result in a synchronization interval of 4 seconds (= 2^2). Note: Sync interval = $2^{\text{Log sync interval}}$ seconds, see IEEE 1588-2008, clause 8.2.5.4.3.
Log min pdelay request interval	Use this field to specify the logarithm to the base 2 of the minimum permitted mean time interval between successive Pdelay_Req messages (interval in 2^x seconds). See "logMinPdelayReqInterval" in IEEE 1588-2008. *Only available for PTP profile "Default P2P" and "Power Systems"!* For example, a value of 0 will result in an interval of 1 second (= 2^0). Note: Minimum pdelay request interval = $2^{\text{Log min pdelay request interval}}$ seconds, see IEEE 1588-2008, clause 8.2.5.4.5.
Log min delay request interval	The logarithm to the base 2 of the minimum permitted mean time interval between successive Delay_Req messages (interval in 2^x seconds). This value is determined and advertised by a master clock based on the ability of the master. *Only available for PTP profile "Default E2E"!* For example, a value of 1 will result in an interval of 2 seconds (= 2^1). Range: Log sync interval <= Log minimum delay request interval <= Log sync interval + 5 ... ...

Log min delay request interval (cont.)	Note: Minimum delay request interval = $2^{\text{Log min delay request interval}}$ seconds, see IEEE 1588-2008, clause 8.2.5.3.2. See IEEE 1588-2008 for more detailed information.
Log announce interval	Use this field to specify the mean time interval in 2^x seconds between successive Announce messages. See "logAnnounceInterval" in IEEE 1588-2008. For example, a value of 1 will result in an interval of 2 seconds (= 2^1).
Announce receipt timeout	Use this field to specify the number of "Log Announce Interval" intervals that have to pass without the receipt of an Announce message before an ANNOUNCE_RECEIPT_TIMEOUT_EXPIRES event occurs. See "announceReceiptTimeout" in in IEEE 1588-2008.
IPv6 multicast scope	Use this field to specify the scope value of the IPv6 multicast address used for all PTP messages except peer delay mechanism messages (see IEEE 1588-2008, E.3). All clocks in a network that shall be synchronized to each other must use the same IPv6 multicast scope, i.e., have the IPv6 multicast scope parameter set to the same value. Only available for PTP profiles "Default E2E" and "Default P2P" and Transport "UDP IPv6".
General DSCP, Event DSCP	The *OTMC 100* allows configuration of the Differentiated Services Code Point (DSCP, see RFC 2474) value of IPv4 and IPv6 PTP packets. Use these fields to specify the DSCP value for PTP general messages and PTP event messages. If your network does not use Differentiated Services according to RFC 2474, use the default value (zero). Only available for PTP profiles "Default E2E" and "Default P2P" and Transport "UDP IPv4" and "UDP IPv6".

8.3.3.4 Alternate Timescale pane (only available for Power Profile)



This pane is only available for the Power Profile according to IEEE C37.238-2011 supported by the *OTMC 100p*.

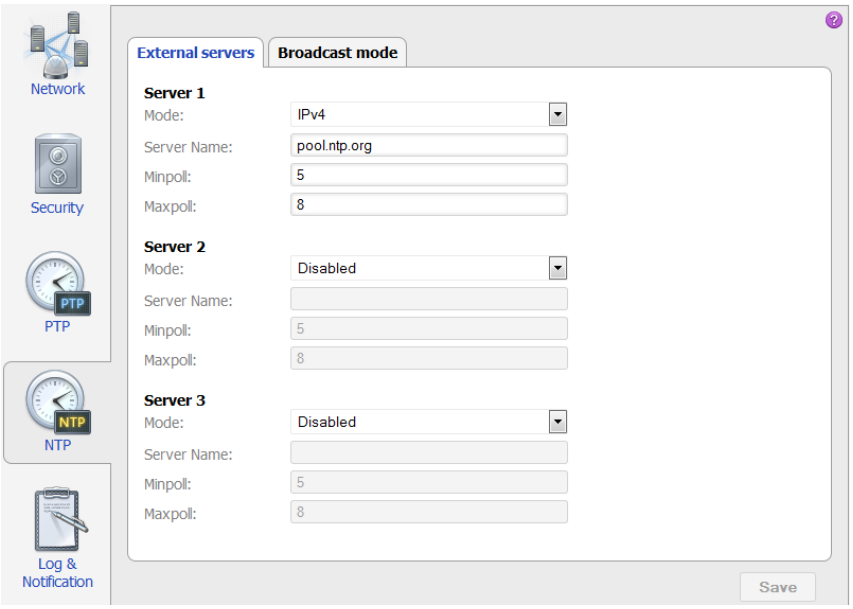
Display name	Use this field to specify the designation of the alternate timescale (ALTERNATE_TIME_OFFSET_INDICATOR TLV). Text of max. 10 characters. See "displayname" and "ALTERNATE_TIME_OFFSET_INDICATOR" in IEEE 1588-2008 (clause 16.3.3.7) and IEEE C37.238-2011.
Current offset	Use this field to specify the value for the ALTERNATE_TIME_OFFSET_INDICATOR TLV. This is the offset (in seconds) of the alternate time from the node time. The alternate time is the sum of this value and the node time. See "ALTERNATE_TIME_OFFSET_INDICATOR" in IEEE 1588-2008 (clause 16.3.3.4) and IEEE C37.238-2011.

8.3.4 NTP Configuration Page

The NTP server on the *OTMC 100* requires an accurate time source before any NTP client can synchronize to it. Two time sources are possible: GPS or external NTP servers. If at least one time source becomes available, it will take a few seconds until the NTP server synchronizes to the time source.

Select the corresponding pane to specify your NTP configuration settings. Click the **Save** button to save and apply your NTP configuration specified in the individual tabs to the *OTMC 100*.

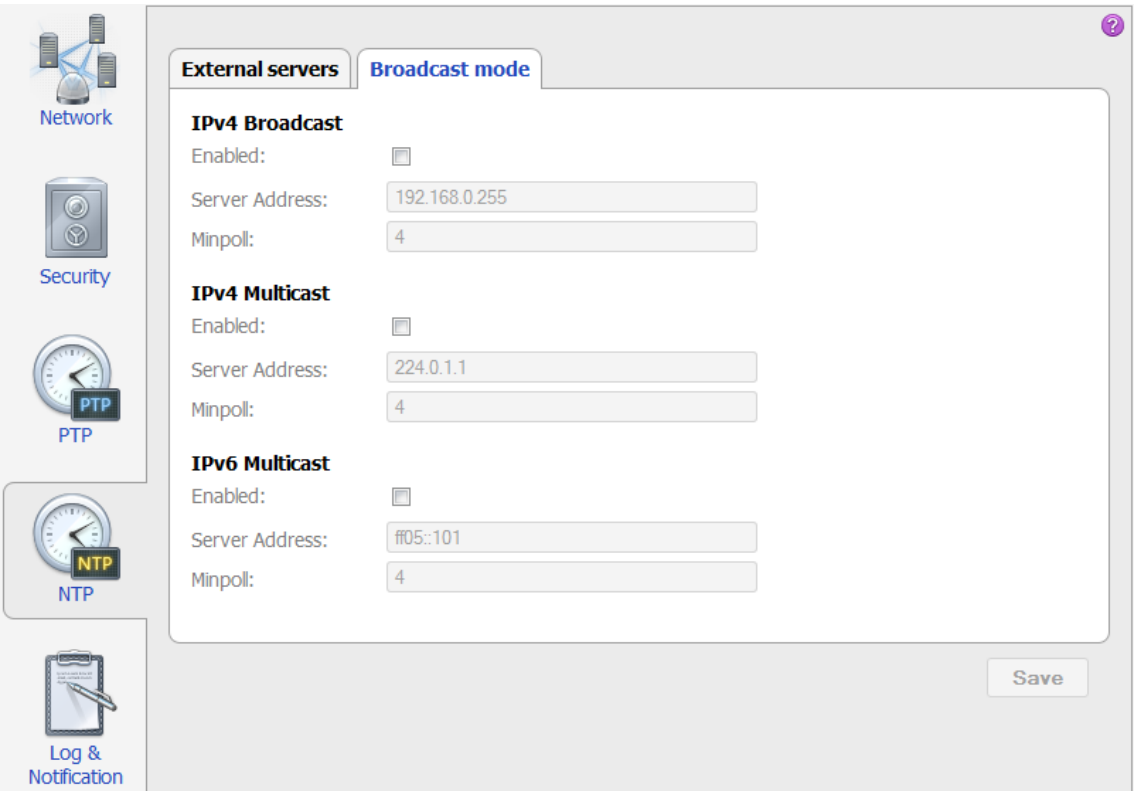
8.3.4.1 External Servers pane



Use this pane to specify external NTP servers, for example to improve safety if the GPS signal fails. If you are exclusively using GPS as an NTP time source it is not necessary to specify an NTP server on this tab.

Mode	Select 1 to 3 sources from where the *OTMC 100* should receive NTP time information **if it is not locked to GPS satellites**. The more sources you specify, the more accurate is the NTP time information the *OTMC 100* can deliver. Select **IPv4** or **IPv6** and enter the address of an NTP time server (e.g. pool.ntp.org) to the respective field. Or select **Disabled** if you do not want to use it. Use the corresponding **Minpoll** and **Maxpoll** fields to enter the minimum and maximum polling interval as a power of 2 (i.e., in 2^x seconds). For example, if you enter a value of 5, the *OTMC 100* will poll the NTP time server every 32 seconds (= 2^5). Possible values: 4 to 17 resulting in an interval between 16 and 131072 seconds.

8.3.4.2 Broadcast Mode pane



The most common configuration is the client/server mode where every client sends a request to the server to retrieve the current time. No separate configuration is required for this mode.

The broadcast/multicast mode works by broadcasting the time into the network. In this case, the clients must be configured to listen for broadcast/multicast messages in the network. This mode can be configured on this tab.

Explanation:

Broadcast means that data packets are sent from one point (here: *OTMC 100*) to all other subscribers of a computer network. Broadcast is not supported by IPv6.

Multicast means that data packets are sent to a specific subset of subscribers only. This subset of subscribers is specified by an address range, the multicast address. Multicasting therefore allows much more efficient distribution of information.

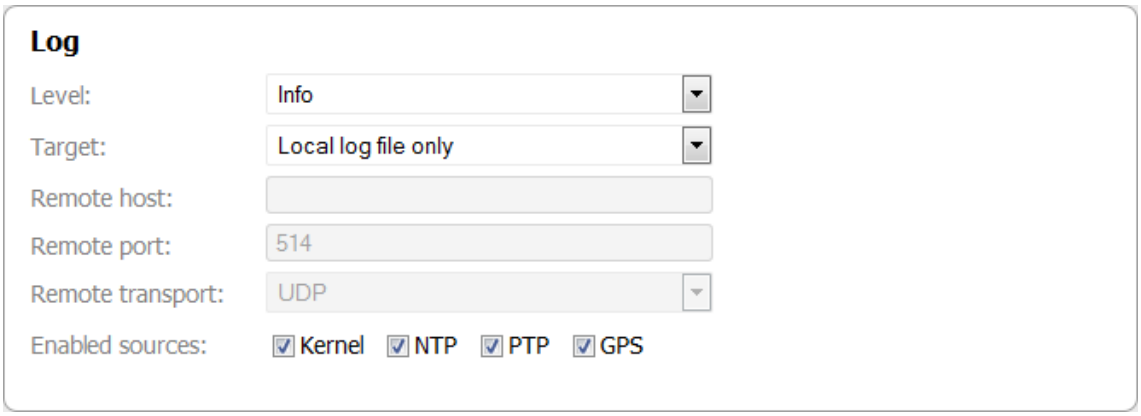
IPv4 Broadcast	Select the **Enabled** check box to enable the sending of IPv4 broadcast messages containing NTP time information. If enabled, enter the broadcast IP address in dot-decimal notation (e.g.: 192.168.0.255). **Minpoll** specifies the interval for sending the broadcast messages as a power of 2 (i.e., in 2^x seconds). Possible values for **Minpoll**: 4 to 17 resulting in a broadcast interval between 16 and 131072 seconds.
IPv4 Multicast	Select the **Enabled** check box to enable the sending of IPv4 multicast messages containing NTP time information. If enabled, enter the IPv4 multicast address in dot-decimal notation (e.g.: 224.0.1.1). **Minpoll** specifies the interval for sending the multicast messages as a power of 2 (i.e., in 2^x seconds). Possible values for **Minpoll**: 4 to 17 resulting in a broadcast interval between 16 and 131072 seconds.
IPv6 Multicast	Select the **Enabled** check box to enable the sending of IPv6 multicast messages containing NTP time information. If enabled, enter the IPv6 multicast address in hexadecimal notation (e.g.: ff05::101). **Minpoll** specifies the interval for sending the multicast messages as a power of 2 (i.e., in 2^x seconds). Possible values for **Minpoll**: 4 to 17 resulting in a broadcast interval between 16 and 131072 seconds.

See the "ntp.conf man page" for a more detailed description of the NTP parameters (see Linux command "man ntp.conf").

8.3.5 Log & Notification Page

Select the corresponding pane to specify your settings for the logging of system messages and the event notification. Click the **Save** button to save and apply your log & notification settings specified in the individual tabs to the *OTMC 100*.

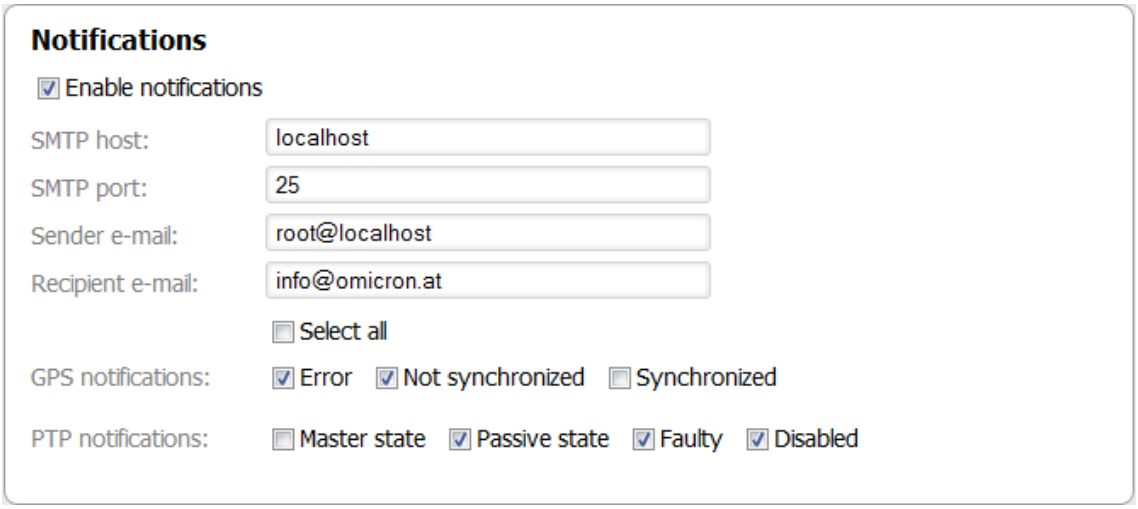
8.3.5.1 Log pane



Level	Use this list box to select the level as of which you want to have system messages logged to the selected target. Lower levels include the messages of higher levels. The following levels are available (starting from the lowest level): **Debug**, **Info**, **Warning**, **Error**, **Critical**.
Target	Use this list box to select the target where you want to have the system messages logged to: **Local logfile only**: Logging is performed to the internal log file that can be viewed using the **Log Viewer page** (see page 61) in the **Status** section. **Local log and IPv4 syslog server** and **Local log and IPv6 syslog server**: Logging is performed to the internal log file and to the specified syslog server for IPv4 or IPv6 installed in the network.
Remote host & Remote port	Use this field to specify the hostname and port number of the syslog server in the network used as log target for the system messages. ...

Remote host & Remote port (cont.)	Only active if the **Target** list box is set to **Local log and IPv4/IPv6 syslog server**.
Remote transport	Use this field to specify the network transport protocol of the IPv4 or IPv6 syslog server, if selected in the **Target** field. Select **UDP** (User Datagram Protocol) or **TCP** (Transmission Control Protocol).
Enabled sources	Select the corresponding check box to enable logging for a particular message type (e.g., GPS messages, PTP messages, etc.).

8.3.5.2 Notifications pane



The event notification function can be used to generate e-mail messages on the occurrence of specific events.

Enable notifications	Select the check box to enable the event notification function and activate the fields and controls in this tab.
SMTP host & SMTP port	Use this field to specify the hostname and port number of the SMTP (e-mail) server.
Sender e-mail	Use this field to specify the e-mail address of the *OTMC 100*.

Recipient e-mail	Use this field to specify the recipient e-mail address for the event notification messages.
GPS notifications	Select the corresponding check box to enable e-mail notification for an event. **GPS error**: Notification in case of GPS errors. **GPS not synchronized**: Notification if the OTMC 100 has lost GPS synchronization. **GPS synchronized**: Notification if the *OTMC 100* gained GPS synchronization.
PTP notifications	Select the corresponding check box to enable e-mail notification for an event. **PTP master state**: Notification if the *OTMC 100* entered the PTP master state. The PTP master state is automatically assigned to the PTP clock that is able to provide the most accurate time information of all clocks available in the network. **PTP passive state**: Notification if the *OTMC 100* left the PTP master state because it is no longer able to provide accurate time information or, if more than one PTP grandmaster clock is available in the network, because another grandmaster clock provides more accurate time information than the *OTMC 100*. **PTP faulty**: Notification if PTP time information is no longer available in the network due to an occurring error in the *OTMC 100*. **PTP disabled**: Notification if the Precision Time Protocol (PTP) service has been disabled in the Network configuration (see page 64).

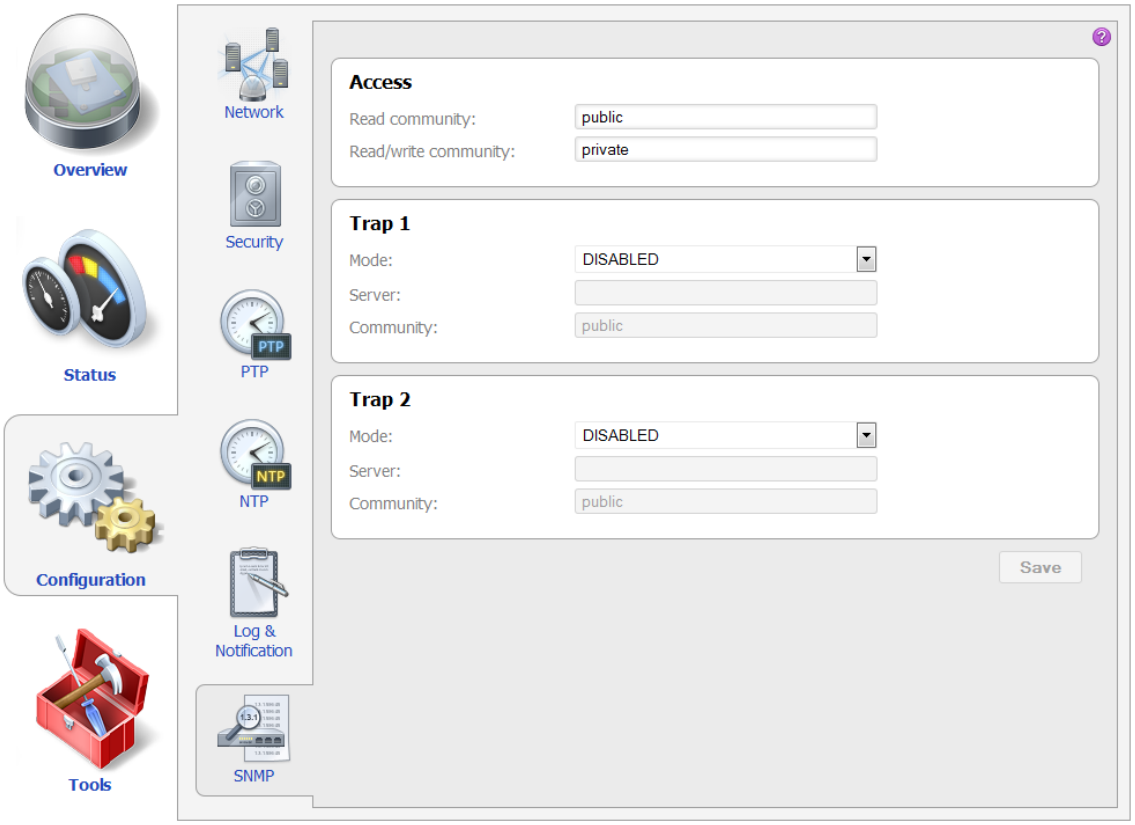
8.3.6 SNMP Configuration Page

Configuration via the Simple Network Management Protocol (SNMP) is only possible for the power profile settings (as defined by IEEE C37.238-2011 MIB) of the *OTMC 100p*. No other settings can be configured via SNMP.

Use this page to configure the access via the Simple Network Management Protocol (SNMP). Click the **Save All** button to save and apply your SNMP configuration specified in the individual tabs to the *OTMC 100*.

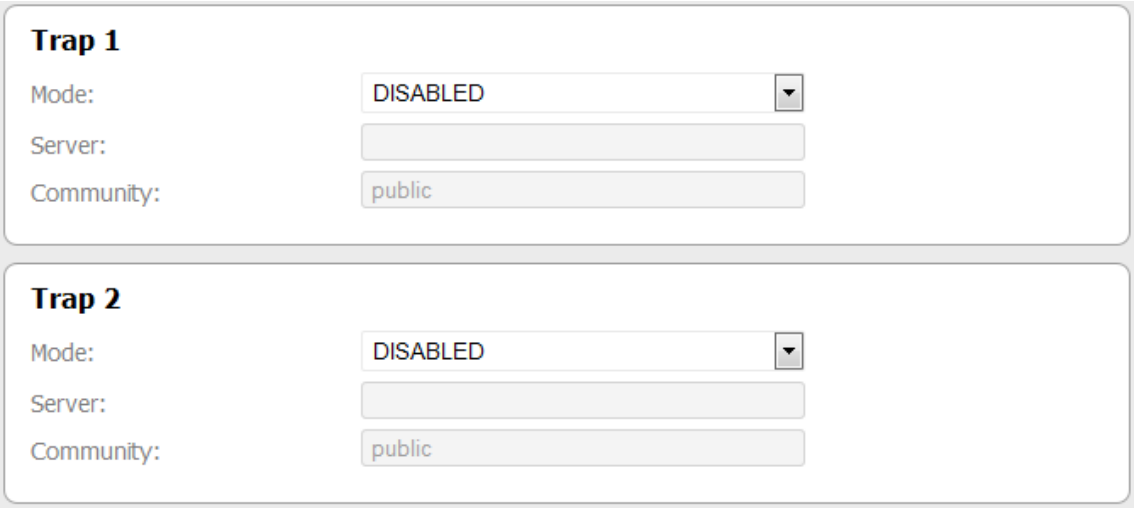
A MIB file is required for proper representation of the *OTMC 100* settings in SNMP clients. Refer to the **Device Control page** (see page 92) of the **Tools** section to download the MIB file from the *OTMC 100*.

8.3.6.1 Access pane



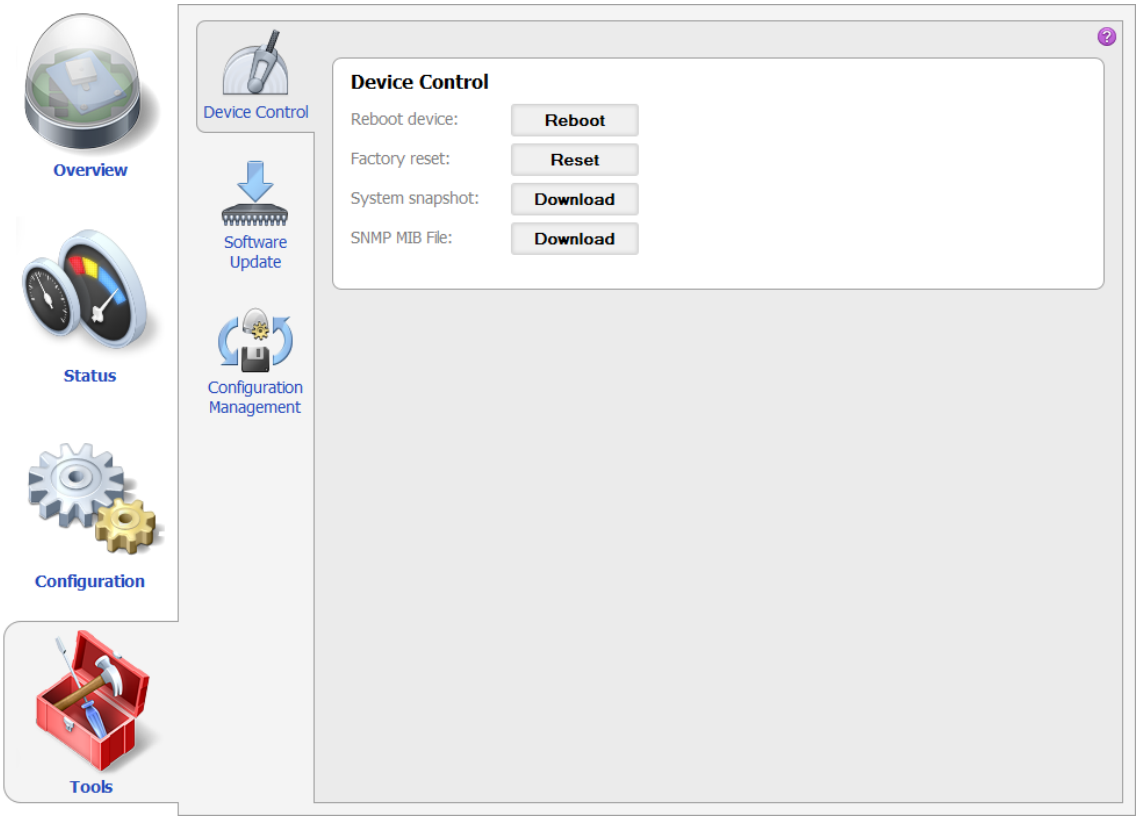
Read community	Use this field to specify the community name for read access. SNMP clients of this community can obtain read access to the *OTMC 100*.
Read/write community	Use this field to specify the community name for read and write access. SNMP clients of this community can obtain read and write access to the *OTMC 100*.

8.3.6.2 Traps pane



Trap 1 Trap 2	The *OTMC 100* is able to act as an SNMP agent that actively sends messages to an SNMP manager in case of occurring events. You can specify two separate SNMP managers (**Trap 1** and **Trap 2**) as the recipients of these messages. Select **Disabled** from the list box to disable this function. Or select **Trap** to send a trap message or **Inform** to send an inform request to the SNMP manager in case of an occurring event. Such messages can only be initiated by the notifications defined in the power profile.
Server	Use this field to enter the IP address of the server acting as SNMP manager.
Community	Use this field to define the community name.

8.4 Tools



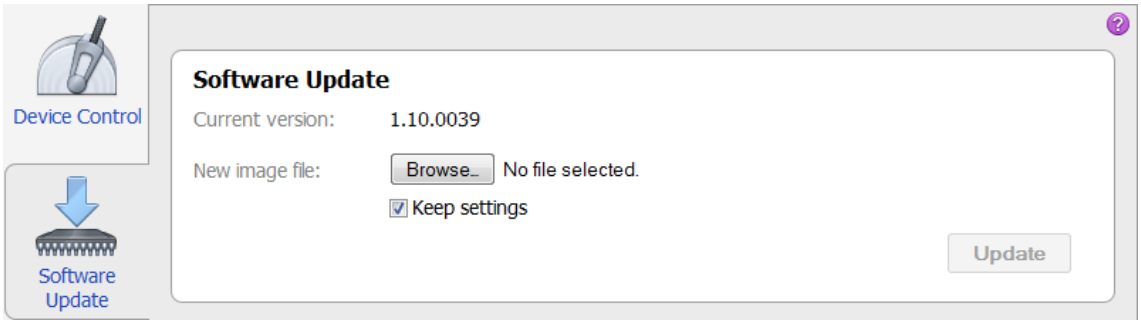
The following pages are available in the **Tools** section:

Device Control (see page 92)	**Software Update** (see page 93)	**Configuration Management** (see page 94)

8.4.1 Device Control Page

Reboot device	Click the **Reboot** button to initiate a device reboot. A reboot can also be performed using the pushbutton on the device.
Factory reset	Click the **Reset** button to initiate a factory reset in order to reset the device configuration to the factory defaults. The factory reset deletes all user specific settings. A factory reset can also be performed using the pushbutton on the device.
System snapshot	Click the **Download** button to download a system snapshot containing all configuration settings and the log file. The system snapshot contains important information for the technical support in case of problems.
SNMP MIB File	A MIB (Management Information Base) file is required for proper representation of the power profile settings of the *OTMC 100p* in SNMP clients. Click the **Download** button to download the MIB file from the *OTMC 100p*.

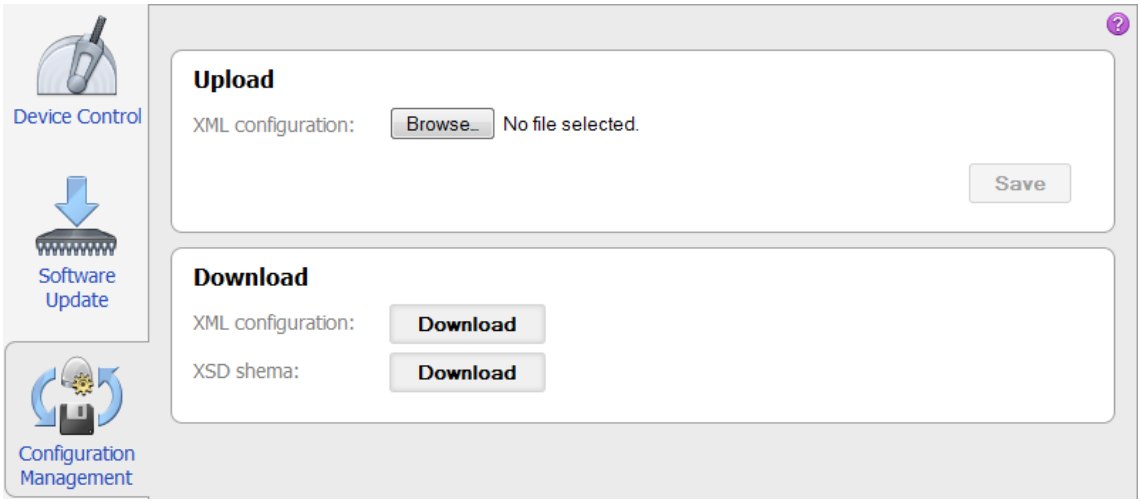
8.4.2 Software Update Page



Current version	Displays the version number of the software currently installed on the *OTMC 100*.
New image file	Click the **Browse...** button to navigate to the software image file. The path and file name is displayed in the field after selecting it in the file open dialog.
Keep settings	If this check box is selected, the user specific configuration settings are kept during a software update. Deselect the check box to automatically reset the device configuration to the factory defaults after a software update.
Update button	Click the **Update** button to start the software update. The update process may take several minutes. Do not disconnect the *OTMC 100* or the computer during this process. The *OTMC 100* automatically restarts after the software update completed.

If the software update process fails due to any reason, the *OTMC 100* will enter a recovery mode on the next power-up. In this mode, the device provides only a rudimentary Web Interface (similar to the **Software Update** page) just allowing for the upload of a software image.

8.4.3 Configuration Management Page



Upload

XML configuration	Use this function to upload a prepared configuration file to the *OTMC 100* and apply this configuration on the device. Click the **Browse...** button to navigate to the XML configuration file. The path and file name is displayed in the field after selecting it in the file open dialog. Click the **Save** button to upload and save the configuration file to the *OTMC 100*.

Download

XML configuration	Click the **Download** button next to **XML configuration** to download the current configuration of the *OTMC 100* in XML format.
XSD	Click the **Download** button next to **XSD schema** to download the XML Schema Definition defining the XML structure of the XML configuration file from the *OTMC 100*.

9 Automation Interface

The *OTMC 100* series offers secure shell (SSH) access to its internal Linux operating system for remote configuration.

It provides the following functionality:

- Configuration management (backup and restore)
- Download of log files
- Usage of Linux shell utilities (e.g. ping)

9.1 Access

The *OTMC 100* supports TFTP, FTP and SSH access. By default you can login via FTP/SSH using the user name **omicron** and the password **timeserver**. The Web Interface, the SSH, and the FTP server use the same password. Therefore, changing the password in the Web Interface will also update the password for the other services.

Anonymous access is possible via TFTP and FTP, however, without the option to upload files. In order to upload files, we recommend the secure SCP (Secure Copy) instead of FTP, where passwords are not transmitted in plain text. Note that the TFTP and FTP services can also be disabled if not needed.

The log and configuration files are located in the home directory of user omicron ("/home/omicron") in the respective subfolders "config" and "log".

9.2 Configuration

All configuration options are stored in a single XML file that can be edited easily. The XML file contains the same options as the Web Interface (which is in fact just a front end for the XML file). Additionally, an XML Schema Definition (XSD) is provided to ensure that only valid configuration options are set.

This makes it possible to easily clone a device even from distant locations. Just download the configuration file from one *OTMC 100*, edit it if required (e.g. change the IP address) and upload it to another *OTMC 100*.

Further instructions regarding the automated configuration via SSH can be found in the readme file located under "/home/omicron/doc/readme.txt".

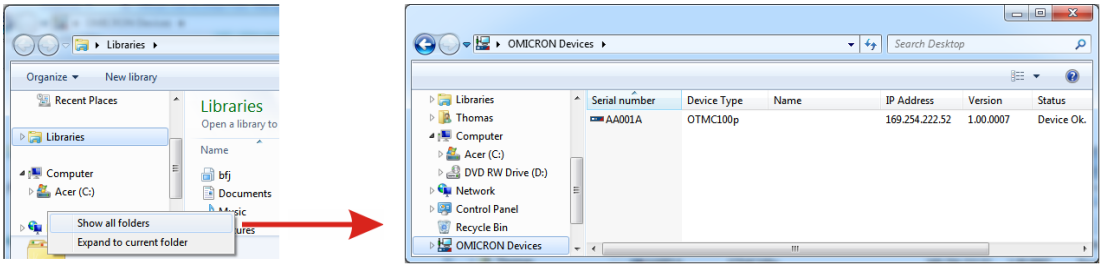
10 The OMICRON Device Browser

By means of the OMICRON Device Browser you can access network compatible OMICRON devices. The Device Browser automatically finds all OMICRON devices available in the computer network.

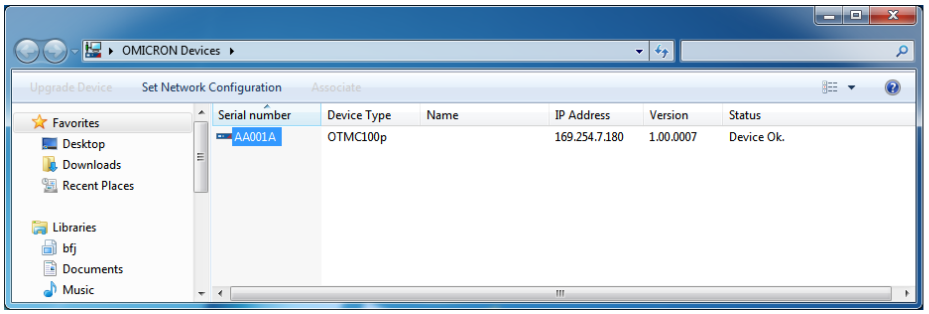
Having the Device Browser installed on your computer, the OMICRON devices may be displayed in one of two ways:

1. When using the regular Windows Explorer, the OMICRON devices appear in the Windows Explorer's folder tree in a section called OMICRON Devices, their serial numbers presented like regular first-level folders.

   If necessary, right-click on a free area of the Windows Explorer's folder tree and select the **Show all folders** option to display the OMICRON Devices section in the Windows Explorer.



2. Alternatively, double click the OMICRON Devices desktop icon. This launches a Windows Explorer window listing the OMICRON devices detected in the computer network with their serial number, device type/name and IP address.



There is no functional difference; use whatever method is more convenient for you. Even though the Device Browser help system focuses on accessing devices via the "regular" Windows Explorer, when working from the OMICRON Devices Explorer window, the handling is basically identical.

Click the help button in the top right corner of the Device Browser Explorer window to view the Device Browser help providing detailed information about the Device Browser.

10.1 Installing the OMICRON Device Browser

The OMICRON Device Browser and its installation program Setup Wizard are included on the CD ROM accompanying the *OTMC 100*. Proceed as follows to install the OMICRON Device Browser:

1. Exit all other major programs running on your computer.
2. Insert the CD ROM into your computer's CD ROM drive and click **Install Device Browser** on the start page. Should the start page not be displayed automatically a few seconds after the CD has been inserted into the CD ROM drive, change to the Windows Explorer and double-click autorun.exe on the CD ROM.
3. Follow the instructions displayed on the screen to install the software.

Note regarding firewall requirements: The OMFind service sends and receives network packets on UDP port 4987 and 4988. The OMICRON Device Browser installer will configure the Windows firewall appropriately during installation on supported systems. If you have a separate "personal" firewall enabled, ensure that UDP ports 4987 and 4988 are open for the OMFind service.

10.2 Finding OMICRON Devices in the Device Browser Manually (OMFind)

Normally the Device Browser automatically finds the OMICRON devices connected to the network. If not, it is also possible to manually search the network for available OMICRON devices.

Proceed as follows:

1. Right-click the **OMICRON Devices** desktop icon.
2. On the context menu, select **OMFind** and then click **Find Devices**.
3. This will start the Device Discovery tool. This tool is intended to diagnose network/firewall problems when the *Device Browser* lists no or not all expected test sets.
4. Click the **Start Discovery** button to manually search for OMICRON devices connected to the network. Once the search is finished, the Discovered devices section lists network parameters of all found OMICRON devices.

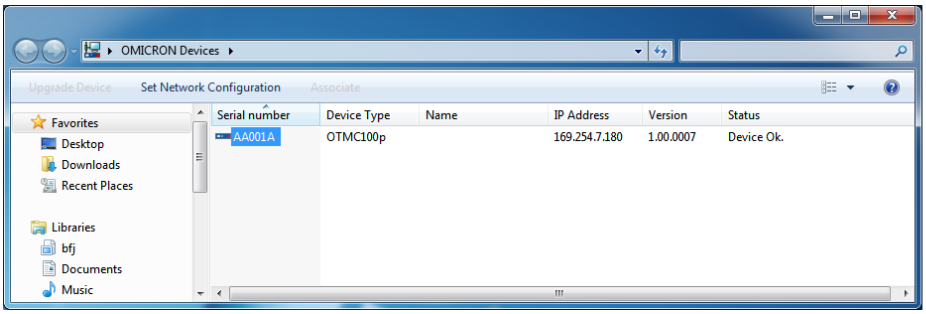
Some of the available firewall/tunneling products are capable of stopping even the **Start Discovery** feature of the Device Discovery tool. So you will not find any OMICRON devices on the network this way. In this case, the network parameters list stays empty once a search is finished. If you experience such a behavior, this may indicate a firewall/tunneling software blocking the network communication.

Click the help button in the top right corner of the Device Browser Explorer window to view the Device Browser help providing detailed information about the OMFind service.

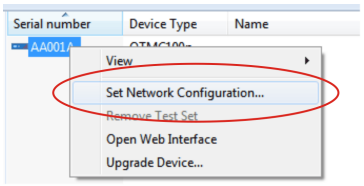
10.3 Accessing the OTMC 100 Web Interface

Proceed as follows to access the OTMC 100 Web Interface:

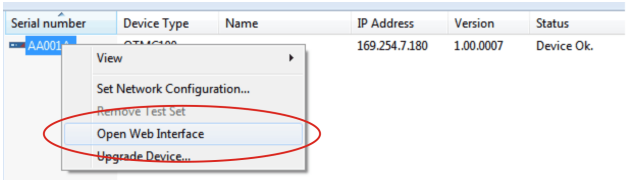
1. Launch the OMICRON Device Browser.
2. The Device Browser will automatically find and display the *OTMC 100*.



If the IP address configurations of the *OTMC 100* and the computer are not compatible, the respective status is displayed in the Status column. In this case, right-click the *OTMC 100* serial number and select **Set Network Configuration** to assign a suitable IP address to the *OTMC 100*.



3. Right-click the *OTMC 100* serial number and select **Open Web Interface** from the context menu.



4. The start page of the OTMC 100 Web Interface is displayed in a web browser.

11 Technical Data

You can find more detailed technical data on the OMICRON Lab web site www.omicron-lab.com.

11.1 General Specifications

Dimensions	Overall height (without connector and mounting kit): 106.2 mm/4.17" Diameter: 115.5 mm / 4.55"
Weight	< 500 g / 1.1 lbs
Degree of protection	IP67 according to EN 60529
Timing accuracy	+/- 100 ns to reference time (TAI/UTC)
Ethernet port	Waterproof Ethernet connector according to IEC 61076-3-106 (variant 4), 10Base-T/100 Base-TX
Power supply	Power over Ethernet (PoE), class 1 powered device according to IEEE 802.3af
Power consumption	< 2 W
GPS performance	12 channel GPS receiver Frequency: 1575.42 MHz, L1 band

11.2 Environmental Conditions

Temperature range	Operation: -40 °C to +70 °C (-40 °F to +158 °F) Storage: -40 °C to +85 °C (-40 °F to +185 °F)
Weathering resistance	For outdoor use (IP67)

11.3 CE Conformity, Electromagnetic Compatibility (EMC), Certificates

CE conformity	The product adheres to the specifications of the guidelines of the council of the European Community for meeting the requirements of the member states regarding the electromagnetic compatibility (EMC) Directive 2004/108/EC.
EMC emission	EN 55022:2010 class B, EN 61326-1:2013
EMC immunity	EN 55024:2010, EN 61326-1:2013, EN 62305-4:2010
Safety	IEC 60950-1:2005 2 Ed. +A1:2009, IEC 60950-22:2005
Certificates	TÜV SÜD Production monitored Safety tested Manufactured under an ISO 9001 registered system.

12 Open Source Software License Information

Parts of the *OTMC 100* software are under OMICRON license, other parts are under open source software licenses. For the complete licensing information on the open source software, please launch the *OTMC 100* Web Interface and click the License Information hyperlink in the bottom right corner.

The open source code is available on the Internet under www.omicron.at/opensource. Open this address in your Internet browser, click the **Download Software** button, and navigate to the **OTMC 100/** directory. Look for the file containing your corresponding version in the file name (for example, "Open Source OTMC 100 1.00.zip" for version 1.00). In addition to some open source code packages, the archive contains an overview of all license information of the *OTMC 100* software.

Open source software
The following table lists the open source software packages and their license types for the *OTMC 100* software.

OTMC 100 software (version 1.10)

Package	License type	Package	License type
am1808_kernel	GPL2	libpcre	BSD
busybox	GPL2	libxml2	MIT
cakePHP	MIT	lighttpd	BSD
calimero_avahi (avahi)	LGPL2	mtd-utils	LGPL2
calimero_ntp (ntp)	BSD	net-snmp	BSD
calimero_uboot (uboot)	GPL2	openresolv	BSD
dhcp	BSD	openssh	BSD
ethtool	GPL2	openssl	BSD
expat	MIT	php	PHP
fcgi	MIT	pv	Artistic2
glibc	LGPL	rsyslog	GPL3
jquery-tools	MIT	tftp-hpa	BSD

jquery-ui-timepicker	MIT	vsftpd	GPL2
jquery-ui	MIT	wsdlGen	BSD (revised)
jquery	MIT	xcache	BSD
libconfigpp	LGPL	xinetd	PanagiotisTsirigotis
libdaemon	LGPL2	zlib	BSD
liblog4cpp	LGPL2		

13 Glossary

ATE	Automatic Test Equipment
BMCA	Best Master Clock Algorithm
BSW	British Standard Whitworth
CET / CEST	Central European Time / Central European Summer Time
DNS	Domain Name System
DNS-SD	DNS Service Discovery
E2E	End-To-End
FTP	File Transfer Protocol
GPS	Global Positioning System
HTTP	HyperText Transfer Protocol
HTTPS	HyperText Transfer Protocol Secure
IED	Intelligent Electronic Device
IP	Internet Protocol
MAC address	Media Access Control address
mDNS	Multicast DNS (Domain Name System)
MIB	Management Information Base
NTP	Network Time Protocol
P2P	Peer-To-Peer
PoE	Power over Ethernet (according to IEEE 802.3af)
PTP	Precision Time Protocol
RFC	Request for comment
SCP	Secure Copy
SELV	Safety Extra Low Voltage
SLAAC	Stateless Address Autoconfiguration

SNMP	Simple Network Management Protocol
SSH	Secure Shell
TAI	International Atomic Time
TCP	Transmission Control Protocol
TFTP	Trivial File Transfer Protocol
UDP	User Datagram Protocol
UT1	Universal Time No. 1. Variant of the Universal Time (UT) used as reference time for the Universal Time Coordinated (UTC).
UTC	Universal Time Coordinated
XML	Extensible Markup Language
XSD	XML Schema Definition

Support

When you are working with our products we want to provide you with the greatest possible benefits. If you need any support, we are here to assist you!

24/7 Technical Support - Get Support

www.omicron-lab.com/support

Offering our customers outstanding support is one of our top priorities. At our technical support hotline, you can reach well-educated technicians for all of your questions. Around the clock – competent and free of charge.

Make use of our 24/7 international technical support hotline:
Americas: +1 713 830-4660 or +1 800-OMICRON
Asia-Pacific: +852 3767 5500
Europe / Middle East / Africa: +43 59495 1000

Additionally, you can find the OMICRON Lab Service Center or OMICRON Lab Sales Partner closest to you at www.omicron-lab.com.

OMICRON electronics GmbH, Oberes Ried 1, 6833 Klaus, Austria. +43 59495.

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Version 2.0

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